# Rent, Greed and Civil War

*A Critical Evaluation of Natural Resources and Civil War*

Stein Omar Gjendem


Master's Thesis
Department of Political Science
Faculty of Social Sciences

University of Oslo

May 2012

# Rent, Greed and Civil War

A Critical Evaluation of Natural Resources and Civil War

2012

Rent, Greed and Civil War: A Critical Evaluation of Natural Resources and Civil War

Stein Omar Gjendem

http://www.duo.uio.no/

Trykk: Reprosentralen, Universitetet i Oslo

# Abstract

Do natural resources cause civil war? Scholars disagree on the resource-conflict link. One common model of explanation, the greed model, asserts that natural resource provide an incentive to rebel. Natural resource, however, only increases the exposure to conflict at first. When a certain threshold of rent from natural resources is reached, the government's control allows it to overbid the rebels in the battle for "labor". With more resources the incumbent(s) can also spend more on defense and deterrence, thereby raising the cost of a rebellion.

First, this thesis argues that the implied rent-seeking claim essential to the greed model excludes certain political determinants which could mitigate the adverse effects of natural resource dependence. Bestowed with vast amounts of natural resources leaders might induce corruption, patronage and individual rent-seeking behavior to buy off any would-be rebels. Second, it also attempt to address how the predominant measure of natural resource dependence, namely primary commodity export/GDP, is perhaps an insufficient measure of a country's economic dependence on natural resources. Third, research on natural resources and civil war has to large extent alternated between the use of dependence and abundance measures, and treated them as identical. The analyses here investigate whether different measurements of natural resource yield different results.

# Acknowledgments

I would like to thank my thesis advisor, Halvard Buhaug at the Peace Research Institute of Oslo, for guidance and consultation. He shared much knowledge and experience with me, from which I benefited greatly. Håvard Hegre and Carl Henrik Knudsen also helped me a lot on the way. By allowing me to write this thesis in conjunction with the project *Conceptualization and Measurement of Democracy* I had the privilege of getting feedback from highly competent researchers. They also provided me with a great deal of data and literature.

I would also like to thank my mother, Anne, for all the support she has given me throughout my life. My accomplishments would not have been possible without her love and intellect, and I will forever remain indebted to her generosity. My siblings Naima Elisabeth, Sherifa and Jan deserve a lot of gratitude for many beautiful years with enduring support. I also appreciate all the stimulating discussion, supportive shoulder and affection of my dearest Runa, in dark days as well as bright evenings.

Next, I would like to express my gratitude to the many people who have shaped my intellectual life. Among them, Magne Stolpnessæter and Rune Busch, stand out as gladiators on the arena of ideas. Their incalculable munificence of advice, ideas, perspective and friendship mean a lot to me. I also remain indebted to many other scholars, colleagues, friends and people I have met all around the world from whom I have learnt so much and should have remembered so much more. They must all forgive collective praise.

The faults in this *libellus* are mine.

# Table of Contents

# List of Tables



# List of Figures

# Chapter 1. Introduction

The causes of civil war are profoundly complex, and arise from numerous dynamics. Explaining the outbreak of conflict has been attempted at least since antiquity by historians such as Thucydides. In contemporary debates much has centered on explanations that relate to real or perceived economic, social, political, ethnic and religious discrimination. Often the language of grievance and misery is applied by the affected parties, and their rhetoric is reflected in popular media and sometimes in scholarly circles. However, in the last decade or so, scholarly research has started to turn its back on a pure grievance approach to conflict. Recent suggestions emphasize a rather cynical elucidation, claiming greed rather than grievance function as an improved theoretical and empirical account for civil war; "*the true cause of much civil war is not the loud discourse of grievance, but the silent force of greed*" (Collier, 1999: 8). The emphasis is more on the economic and financial foundation for rebellion.

Much research has been done on the subject of natural resources, in particular oil, and its political implications. It has almost become common wisdom that natural resources cause several dysfunctional outcomes; authoritarianism, slow and uneven economic development, civil war, corruption, and repression. These outcomes are commonly labeled the "resource curse". Many recent academic contributions find that natural resource dependence is one of the causes of civil war onset (e.g. Collier & Hoeffler 2004; Collier et al. 2003 Fearon and Laitin 2003; Fearon 2004; Ross 2004). They all discuss in some way what and how the link between natural resources and civil war works. Most explanations fall within two distinct models: (1) Finance for rebellion and (2) weak states.

The first, finance for rebellion, often called greed, is derived from research by Collier and Hoeffler (2004). It links natural resources to loot and the opportunity it presents for financing large-scale violence. Resource wealth, however, only increases the exposure to conflict at first. When a certain threshold of rent from natural resources is reached, the government's control allows it to overbid the rebels in the battle for "labor". With more resources the incumbent(s) can also spend more on defense and deterrence, thereby raising the cost of a rebellion.

The second model, weak states, is based on the rentier state theory, and holds that natural resources affect the likelihood of conflict through state capacity (Fearon and Laitin 2003).

States that are dependent on income from natural resources develop less sophisticated bureaucratic capacity than their resource poor counterparts because they are exempted from the need to tax their population (Beblawi 1990). They are also in the danger zone of being afflicted with political and social collapse. These states have fewer incentives to develop the broader economy, as opposed to natural-resource-poor states that are forced to provide broad public goods in order to raise productivity (de Soysa & Neumayer 2007: 202). Weak state structures, accordingly, can make the state more exposed to insurgency.

First, this thesis focuses on the greed model (Collier and Hoeffler 2004) and examines its arguments related to natural resources. The greed argument is also substantiated with other findings that support the resource curse. Further, this thesis argues that the implied rent-seeking claim essential to the greed model excludes certain political determinants which could mitigate the adverse effects of natural resource dependence. Bestowed with vast amounts of natural resources leaders might induce corruption, patronage and individual rent-seeking behavior to buy off any would-be rebels. Their ability to do so should grow with revenue from natural resources. The greed approach to civil war by Collier and Hoeffler (2004) gives no account of why non-violent forms of rent-seeking are insufficient to halt violent threats to state authority. In quantitative literature the theoretical arguments about the resource curse are often presented briefly with little or no focus on what might condition the effect of natural resources (Fjelde 2009). I find the need to examine potential conditional effects of the resource curse important because much literature has avoided this task.

Second, previous research surrounding the resource-conflict link has used varying measurements of natural resources. I seek to clarify how the predominant measure of natural resource dependence, namely primary commodity export/GDP, is perhaps an insufficient measure of a country's economic dependence on natural resources. By focusing solely on export figures we might in fact be indirectly measuring the size of the economy or its level of development. Most natural resource producing poor states export the majority of their produce, while developed countries consume most of their produce domestically. Moreover, measuring only exports will not provide information on the *actual value* of natural resources extracted, which is relevant if greed and finance for rebellion determine conflict onset. There is also reason to believe that different resources have different effects on the incentive to rebel due to varying degrees of "lootability", and that a disaggregation of the various natural resources is valid. Consequently the nature of my admonition towards the use of export figures is both methodological and theoretical.

Third, research on natural resources and civil war has to large extent alternated between the use of dependence and abundance measures, and treated them as identical (Basedau & Lay 2009). Little discussion of the variety of different conceptualizations of natural resource dependence and abundance leaves us bewildered. Dependence is the extent to which a state`s income is derived from a specific resource, while *abundance* means the absolute amount of resource rents available. Mechanisms leading to the occurrence or non-occurrence of conflict might be conditioned not only by a country's level of dependence, but also abundance. A country's level of dependence, *per se*, entails little about the level of "loot" available to greed-motivated rebels. Arguably, if the incentive to rebel against state authorities is supposed to grow when the amount of resources available grows, as posited by the greed model, then abundance should be an equally good measure. I therefore use this thesis to run parallel models and see whether the operationalization of abundance and dependence yield similar or different effects on the likelihood of civil war onset.

## 1.1 Structure

The first part of my study is used to clarify key concepts. The second chapter concerns factors other than natural resources which are commonly perceived to be relevant determinants of civil war. In Chapter 4 I explain the greed theory of Collier and Hoeffler. I also review previous findings related to the resource curse in order substantiate the possible consequences of natural resource for internal peace. Next I explain the Rentier Theory, and how it may provide insight into the conditioning effects of natural resources. The chapter is concluded by discussions on the measurement of natural resource, and how this relates to the hypotheses derived from the greed model and the Rentier Theory. Chapter 5 is used to outline the research design I employ, and address methodological and data issues. In Chapter 6 I present the empirical tests and their results. At the end of Chapter 6 I conduct an examination of the predictive power and robustness of the results. I conclude in Chapter 7 with summing up the findings and discussing possible inference from the analyses.

## 1.2 Findings

The analyses show a positive relationship between natural resources and conflict onset. The positive relationship I largely driven by energy resource, while mineral resources only has a negative and significant result in a bivariate analysis. The analyses reject the hypotheses of a curvilinear relationship between natural resources and conflict onset. Further, results also show that both an abundance and a dependence measure of natural resource show a positive relationship with the risk of conflict onset. The results also show a negative and statistically significant interaction term between energy resource dependence and corruption. At higher levels of corruption the positive effect of energy resources become negative and insignificant. These results are, however, sensitive to the intensity threshold of conflict onset.

# Chapter 2. Central Concepts

This section is used to clarify certain key concepts in this thesis.

## 2.1 Civil War

"*The difficulty of characterizing civil wars is a conceptual problem rather than one of measurement*"

(Kalyvas 2003:476)

There is no consensus on what defines a civil war (Sambanis 2004), and some even argue that they are *not* distinct events worthy of separate study (e.g. Tilly 2003) because of recent surge in episodes of mass armed violence that may actually be a new species of war (Mundy 2011). It is true that conflicts are complicated phenomenon. There are challenges with an authoritative labeling of a human conflict, "*civil wars are not binary conflicts but complex and ambiguous processes that foster an apparently massive, though variable, mix of identities and actions – to such a degree as to be defined by that mix*" (Kalyvas 2003: 475). However, most scholars argue that civil wars should be studied separately, and in this thesis I agree they should.

Civil wars are radically different from both interstate wars and communal violence. Contrary to international war, they are fought outside any structure of rules and completely within the territory of a specific society. Unlike communal violence, it indicates a rebel organization equipped with armaments and staffed with full-time recruits, in which both warring sides fail to come to an agreement and instead decide to fight. Under what circumstances rebel groups are able to set up an organization to confront the state and why fighting is chosen have thus become a question for researchers to answer.

This thesis agrees with most scholars that civil wars should be studied as distinct phenomena, and adopts the widely accepted definition of civil war; "*an armed conflict between two domestic parties over contested incompatibility resulting in a number of casualties exceeding a certain threshold*" (Gates 2002: 3-4). An *armed conflict* is; *a contested incompatibility that concerns government and/or territory where the use of armed force between the parties, of*

*which at least one is the government of a state, results in at least 25 battle-related deaths*"[1]. An alternative and very common conceptualization of civil war is from Small and Singer (1982: 210)[2]. They regarded civil war as "*any armed conflict that involves (a) military action internal to the metropole, (b) the active participation of the national government, and (c) effective resistance by both sides*". Thus, the internality of the conflict to the territory of a sovereign state and the state authorities as combatant was important for the definition. Civil wars were also further separated from other forms of internal fighting by *sustained* violence and *effective* exchange of force.

Regardless of the chosen conceptualization, several challenges arise with these "*deceptively straightforward*" definitions of civil war (Smabanis 2004:16). First, it may be hard to distinguishing a civil war from the many types of organized and semi-organized violence. Conflicts rise out of small scale fighting, coups or riots, and applying an ad-hoc classification of a civil war is of course easier than classifying an ongoing conflict. Second, it is not always clear whether a state is actually taking part in a conflict or not. State authorities might use proxies or sponsor gangs that do much of the combat. Combat may also continue after a state has collapsed, such as in Somalia, making it difficult to apply an ideal-type definition of civil war. Third, unreliable and incomplete data make numerical thresholds of deaths to identify civil wars challenging. Fourth, determining when civil wars commence and when hostilities cease is difficult because of sporadic and recurrent fighting (Ibid). Clearly, the task of scientifically studying civil wars is a colossal one.

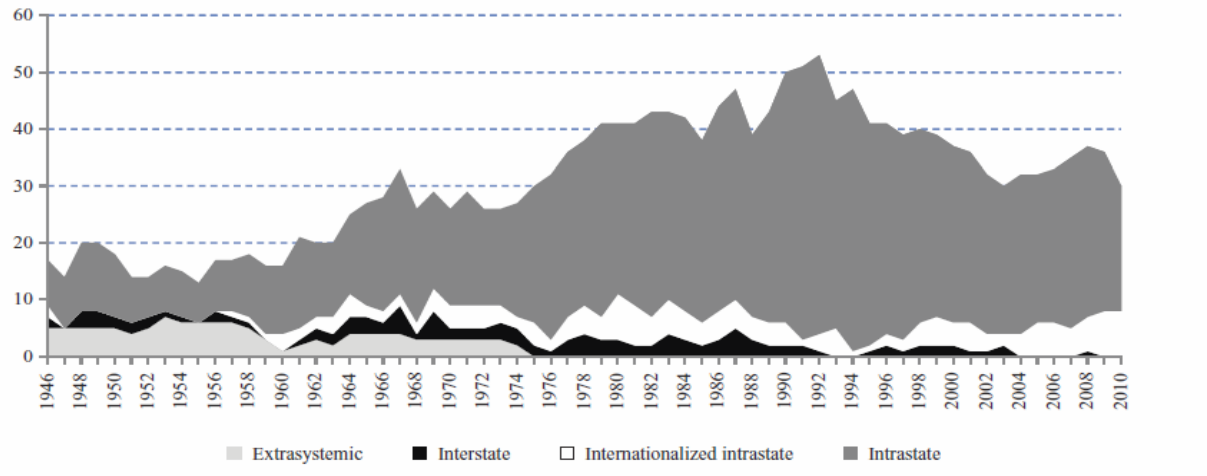
### 2.1.1 Why study civil wars?

Since 1946 most wars have been civil wars, and continue to be so (see Figure 1). The number of intrastate conflicts peaked around the beginning of the 1990s. They sometimes get less attention than international war, but can cause death, maining and human suffering on a large scale. In addition to atrocities associated with civil war there are also colossal economic costs associated with such conflicts. The characteristics of civil wars sometimes escalate the human, social and economic costs beyond that of communal violence and international wars. An example is the conflict between Eritrea and Ethiopia. The conflict between the two states generated both a civil war, and following Eritrean independence, an international war. The

[1] I discuss matters of thresholds for battle-related deaths in Chapter 5.3.1.
[2] Quoted in Sambanis (2004: 816).

civil war lasted for 30 years and military victory was needed to end it. As an international war the conflict was subject to an array of international mediation and ended rapidly in an international settlement (Collier et al. 2003: 11). Civil wars are often development in reverse. The adverse effects of civil war can be divided into three rippling effects on 1) the area/country within which it takes place 2) neighboring countries and 3) globally (Ibid).

**Figure 1.** *Frequency of wars 1946 - 2010*




*Source: Themnér and Wallensteen (2011)*

The perpetrators, those active in combat, only account for a trivial part of the overall suffering caused by civil conflict. The scale of civilian suffering indicates perhaps a lack of understanding by war-initatiors for the potential scale of destruction. The most direct human effects of conflict are of course the fatalities and displacement of populations[3]. Wars are increasingly being fought *over* people rather than *around* people. Moreover, during war-time public expenditure is often diverted from infrastructure and health to military. This diversion of resources from productive to destructive sector is adverse in and of itself when used for violence, but also cause a spiraling effect as infrastructure is targeted and destroyed by all sides of the conflict. The legacy of conflicts is also often sufficiently adverse to hamper any prospect of rapid recovery (Collier et al. 2003).

[3] According to the Internal Displacement Monitoring Centre (IDMC 2011) there were 26.4 million internally displaced people in 2011 resulting from conflict and violence across the world.

The potential spillover effects of civil wars are tremendous. One effect is the exodus of people seeking safe haven in nearby countries, that spread disease and increase social tension. Other effects are regional arms races causing increased hostilities between states and reduced regional investment. The empirical findings of Murdoch & Sandler (2002) suggest that the countries at risk from collateral damages stemming from neighboring civil war are those with a longer shared contigous border with countries at war. Civil wars also tend to cluster, meaning the entire region is at risk of experiencing civil war (Collier et al. 2003).

Civil wars also have the potential for global rippling effects. One consequence is through the effect it has on production and distribution of drugs. Rebels need funding, and civil wars provide large areas outside governmental control for which to grow drugs. Most of the world's opium production today occurs in war torned states. And the storage and distribution of drugs largely rely of the lawlessness civil wars generate. Lawlessness may also provide non-state actors with violent agendas with a shafe heaven from which to launch attacks other places (Collier et al. 2003).

## 2.2 Natural Resources

Natural resources, as defined by the World Bank (2012b) are "*materials that occur in nature and are essential or useful to humans, such as water, air, land, forests, fish and wildlife, topsoil, and minerals*". In turn, these can be classified as either renewable or non-renewable.[4] Renewable resources such as forest, water and cropland can be replenished over time due to natural processes. They are, if used sustainably, indefinite. Nonrenewable resources, however, are found in finite quantities and their value increases as demand grows and/or supplies contract. Examples of these resources are minerals, natural gas, oil, coal and diamond, to name a few. These resources are, according to scientist at the US Army Corps of Engineers, *"…being depleted at an alarming rate, exponentially faster than the biosphere's ability to replenish them*" (Quoted in Klare 2009: 34).

[4]There are numerous other procedures for classifying natural resources. Categories include: strategic raw materials, sources of energy, shared water resources, food, biological resources, energy resources, food resources, land resources, mineral resources, soil resources, and water resources.

## 2.3 Rent

The exact origin of the term "*rent*" is difficult to pinpoint. To Adam Smith (2005: 49 [1776]) wages, rent and profit were "*The three original sources of all revenues as well as of all exchangeable value*"[5]. Rent, in particular, referred to the natural resources of the landlords, which provided not a direct income, but merely a reward for his acquisition and ownership of a particular piece of land: "*Rent, it is to be observed, therefore, enters into the composition of the price commodities in a different way from wages and profit. High or low wages and profit are the causes of high and low price; high or low rent is the effect of it*" (Ibid: 125). Receiving payment for the natural productivity and fertility of the land causes the landlords "*to reap where they never sowed*". Rent is therefore a factor income unrelated to laboring activity. It is income derived from the "*gift of nature*" (Beblawi 1990: 85). Thus, e.g. oil revenue belonging to the state constitutes a rent for that state. Rents are also rentals paid by individuals, concerns or governments to the "rentier"; individuals, concerns or governments (Mahdavi 1970: 1). In this broad sense rent exists in all economies, although in varying degrees.

[5] Oxford English Dictionary defines rent as "*a source or item of revenue or income; a separate piece of property, esp. land, yielding a certain return to the owner*".

# Chapter 3. Causes of civil war – What do we know so far?

"For students of civil wars, the list of cases to study
is long, as is the list of explanatory factors "

(Ward et al. 2010: 364)

I use this section to briefly review some of the common explanations of civil war onset. It is in no way meant to be exhaustive of the collected knowledge on determinants of civil war. To do that goes beyond the scope of this thesis. Rather it reviews some of the common conceptions for why certain states are more likely than others to experience civil war. I subsequently use these arguments in my analysis of civil war onset in order to control for what are thought to be substantially important factors for the likelihood of civil war onset. This is important because I do not replicate previous studies. I have avoided the use of possible replication datasets for three reasons. First, previous studies by Collier and Hoeffler group annual observations into five-year intervals, and focus on whether there was a civil war onset in one of the calendar years during that time. But because their observation of civil war is measured annually, and their choice of five-year periods is fortuitous "*there is a strong case for using country-year as the unit of analysis*…" (Fearon 2004: 4). Second, country-years make lagging of independent variable more consistent and allow the inclusion of rapidly recurring wars. The five-year format loses many observations due to "listwise" deletion of civil war onsets because of missing observations. Third, because of temporal constraints of the independent variables building a model enabled me to extend the temporal coverage of the analysis.

The sub-parts in this section are thematically divided. However, I claim no authoritative boundaries, as these factors might not have such distinct boundaries and might even form a continuum and merge interceptiably into each other. Still, it serves as an organized introduction into the causes of civil war commonly applied in the quantitative field of civil war research.

There is strong consensus among scholars that the risk of civil war decreases as average income increases and the size of the population decreases. "*Beyond these two results, however, there is little agreements*" (Hegre and Sambanis 2006: 509). Several authors have attempted

to sum up the consensus and debates around the explanations of civil war (Sambanis 2002; Gates 2002; Hegre and Sambanis 2006; Dixon 2009).

We do not know *the* model of civil war. Studies of civil war use different definitions of civil war and analyze datasets with different country-year coverage. This makes it difficult to distinguish between variation in estimated results that arise due to spatial and temporal coverage and variation arising from the measurements of independent variables or model specification when the same dependent variable and same country years are analyzed (Hegre and Sambanis 2006). Hegre and Sambanis (Ibid) tested the sensitivity of common measurements used in the civil war literature. They specified 18 different "concepts", in addition to population size and per capita income that are used frequently in econometric models of civil war[6]. For each concept there are differing operationalizations (proxies), with mixed results. By identifying 88 variables used to measure the different concepts they systematically explored how sensitive they were to variations in the set of control variables. Some concepts, like political stability and inconsistent democratic institutions have at least one proxy that is robust (Ibid).

Attempting to gather the collective knowledge on civil war research, Dixon (2009) presents an aggregated study of past quantitative research on civil war. Table 3 presents the current confidence of many "popular" variables used in determining the risk of civil war. Results are obviously mixed, and some of the variance can also be explained by the use of different periods, panel coverage and difference in the operationalization of the dependent and independent variables (Ibid; Sambanis 2002: 230). In subsequent sections I clarify the explanations Dixon (2009) considers to have high levels of confidence, in addition to ethnicity and mountainous terrain. I first consider the economic explanations, followed by demographic, geographic, history and insecurity, and political explanations[7].

[6] Concept 1: Ethnic Difference 2: Ethnic Polarization/Dominance 3: Political Institutions(level of democracy) 4: Institutional Inconsistency 5: Political Instability 6: Type of political Institutions(e.g. proportional representation) 7: Political Centralization 8: Income and Democracy level of Neighboring Countries 9: Region 10: War in Neighboring Countries 11: Economic Growth 12: Trade 13: Social Welfare 14: Natural Resources 15: Demographic and Geographic Characteristics 16: Militarization 17: International Systemic Factors (e.g. Cold War) 18: Colonial History

[7] I address past history and *peace years* in Chapter 5.2.2.

**Table 1.** "*Consensus" Determinants of Civil War.*

| Category | Variable | Direction | Confidence |
|---|---|---|---|
| ***Demographics*** | **Population** | **Positive** | **High** |
| | Population density | Positive | Medium |
| | Ethnic dominance | Positive | Medium |
| | **Social (ethnic and religious) fractionalization** | **Negative** | **Medium** |
| | Ethnic heterogeneity | Positive | Medium |
| ***Geography*** | Asia | Positive | Low |
| | Middle East | Positive | Low |
| | Neighbor is at war | Positive | Medium |
| | Neighbor is democratic | Negative | Low |
| | Non-contiguous | Positive | Low |
| | Large area | Positive | Low |
| | **Mountains** | **Positive** | **Medium** |
| ***Environment*** | Soil degradation | Positive | Medium |
| | Drought | Positive | Low |
| | Climate for heavy grass agriculture | Negative | Low |
| ***Resources*** | Primary diamonds | Positive | Low |
| | **Oil exports** | **Positive** | **High** |
| ***Economy*** | **Development** | **Negative** | **High** |
| | **Growth** | **Negative** | **High** |
| | Investment | Negative | Low |
| | Trade as % GDP | Negative | Low |
| | Primary commodity exports | Curvilinear | Medium |
| ***History and Insecurity*** | **Peace Years** | **Negative** | **High** |
| | Distinct civil war previous year | Negative | Medium |
| | New state | Positive | Medium |
| | Refugees | Positive | Low |
| | Rivalry and interstate war | Positive | Low |
| ***Regime and Policy*** | **Democracy** | **Curvilinear** | **High** |
| | **Regime instability** | **Positive** | **High** |
| | Mass education | Negative | Medium |

Determinants with *high* levels of confidence, in addition to ethnicity/religion and mountains, are underlined.
Source: Dixon (2009: 720).

## 3.1 Economy

## Development

The most widely accepted relationship between economic factors and civil war posits that high-income countries are less likely to experience civil wars than low-income countries. Findings are almost entirely consistent in direction – growth, prosperity and development reduce the risk of civil war (Dixon 2009: 714). According to Collier and Hoeffler (2004) a life in poverty makes people more frustrated, and thus more likely to rebel. Poverty also increases the available recruits (rebel labor supply) because of high amounts of unemployed and

dissatisfied youth. Rebel labor supply declines as the economic opportunity costs of rebellion increases. In richer states, time devoted to production, rather than rebellion and appropriation, pays more than in poor states (Sambanis 2003: 5).

Fearon and Laitin (2003) also find that higher income per capita reduces the likelihood of civil war. However, their argument is that per capita is a general proxy for a state`s financial, administrative and security capacity. If the regime is weak, rebels have higher chances of success. They further ascertain that it also captures the quality of infrastructure and central administrative penetration into rural societies where grievance and separatist sentiment may arise. However, Buhaug and Rød (2006) found no effect of road density on the probability of anti-government (revolutionary) conflict, and only a marginally significant effect on territorial (separatist) conflict. Despite many explanations of why poverty increases the risk of civil war the general acceptance is that a country`s level of development affects the risk of civil war.

## Growth

Hegre and Sambanis (2006) found a robust relationship between economic growth and civil war. Their findings support Collier and Hoeffler`s (2004) assumption that little or no expectations of improved economic conditions creates a breathing ground for grievance. Also, the prospect of worsened economic conditions adds to resentment. But it is difficult to estimate the causal effect of economic growth on civil war. Anticipated wars tend to reduce the investment climate and reduce economic growth. Many "*difficult-to-measure*" economic, social, political and institutional factors might also affect growth (Brückner 2007: 1). Using rainfall as an instrument for income growth in Sub-Saharan Africa, (Ibid) find that low growth increases the likelihood of civil war incidence and onset. But their finding is most robust for autocracies, pointing towards a possible interaction between economic and institutional causes of civil war.

Though much of the contributions in the literature on civil war agree on the relationship between civil war and economic growth, growth may also be accompanied by economic inequality. The question of inequality as a determinant of political violence and revolution has been posed by social philosophers since the time of Aristotle (Muller 1985). In 1840, Toqueville (2005: 501 [1840]) wrote these seemingly timeless words:

> "*Almost all the revolutions that have changed the aspect of nations have been made to consolidate or to destroy social inequality. Remove the secondary causes that have produced the great convulsions of the world and you will almost always find the principle of inequality at the bottom. Either the poor have attempted to plunder the rich, or the rich to enslave the poor. If, then, a state of society can ever be founded in which every man shall have something to keep and little to take from others, much will have been done for the peace of the world*".

Many previous studies have looked at the conflict-inequality nexus, focusing on the role of inequality in igniting violence. The results are mixed. Economic or income inequality can generally be divided into two types, horizontal inequality and vertical inequality. The most common approach to inequality in the civil war literature is by far vertical inequality, and can be understood as the economic difference between the well-off and the worse-off. It is believed that economic inequality is a source of grievance and provides encouragement to rebel. However, both Fearon and Laitin (2003) and Collier and Hoeffler (2004) find no relationship between income inequality and conflict.[8] Horizontal inequality refers to inequalities between *groups* of people with similar background. One argument is that violent conflict is a product of groups feeling relatively deprived to other groups. Østby (2006) explored the concept of such inequalities and conclude that it is not vertical, but horizontal inequality that increases the likelihood of conflict. While most of the measures of horizontal inequality are positively associated with conflict, the effects seem to be most robust when using regional group identifier. The theory of horizontal inequalities and conflict may also be applied to other types of affiliation or group differentiation, such as urban-rural groups, religious, gender and age.

## 3.2 Demography

## Ethnicity

In many parts of the world a person`s ethnicity or social group belonging has profound consequences for his or her physical safety and prospects. Violent confrontation along ethnic lines is one of the most apparent forms of conflict, and has recently claimed lives in many diverse places such as in Afghanistan, Burundi, Indonesia, Northern Ireland, parts of the

[8] Similarly Neumayer (2004) find that inequality is not a statistically significant determinant of violent property crime.

Middle East, former Yugoslavia and Sudan. Ethnic conflict is a worldwide phenomenon (Horowitz 1985: 3). Fearon and Laitin (2003) identify 58 ethnic civil wars in the period 1945 to 1999, constituting about 51% of all civil wars.

Since the end of the Cold War many argue that ethnicity has in fact become an increasingly important cause of conflict. To Gurr and Harff (1994) conflicts between ethnic groups are a result of historical heritage. Following decolonization in Africa and Asia, artificially constructed states were created. Former colonial borders were kept and few new states were ethnically homogenous. Thus competing ethnic groups were forced to live side by side within a state, and some groups were divided between new states. Instead of allegiance to the newly formed nation and its boundaries, these groups are more concerned with keeping and protecting their rights within existing states, or even establishing their own states. Because identities do not coincide with the borders of the new state, these multiethnic states will have a harder time defining and creating a demos, or people, than ethnically homogenous states. This becomes a problem of legitimacy for governments, which may cause discontent and domestic conflict (Ellingsen 2000: 232). Pluralistic societies face a host of pathologies that render them especially prone to conflict and, at the extreme, violence (Fearon and Laitin 2003:78).

With a broad brush, Fearon and Laitin (2003) argue that we distinguish between perennialist and modernist positions on the nature and sources of ethnic nationalism. A perennialist approach stresses the long-standing cultural practices that are said to define and distinguish ethnic groups. These differences are argued to have made conflict more likely. Horowitz (1985: xi) also argues for the importance of ethnicity in conflict; "*The importance of ethnic conflict, as a force shaping human affairs, as a phenomenon to be understood, as a threat to be controlled, can no longer be denied*". The perennialist argument emphasizes the deep-rooted nature of ethnic difference. One proponent of this is Huntington (1996), who says that in the post-Cold War world, the most important distinction among people is not ideological, political or economic. They are cultural. "*Nations and Peoples are attempting to answer the most basic question humans can face: Who are we*"? (Ibid: 21) This has lead to the increased importance of identity in conflict. Amartya Sen (2002), however, in *Identity and violence-the illusion of destiny* sees Huntington's social psychology as a weakness in Huntington's thesis rather than a strength because identity is not a preset hierarchical chain of allegiances. It alters according to situations, and new identities appear and disappear. Consequently, "*them*" is not preset, and neither is "*us*". In addition, the description of an impenetrable universal oneness of

our identity makes our social and political decisions based upon reason seem impoverished or even impossible because Huntington believes it is the identity that constitutes our decision and behavior.

In contrast, modernist theories regard the thoroughgoing politicization of cultural differences that ethnic nationalism represents as a development of the last couple of centuries. The central argument is that economic modernization and the creation of the modern state make upward social mobility possible, but only when sharing the culture of the groups that dominate the society. Separatist nationalist movements develop when there are barriers to upward mobility due to ethnic background. This is all the more relevant when the preexisting cultural differences between minority groups and the dominant group are great. Assimilation is more likely when the preexisting differences are small. Both approaches, the perennialist and modernist, imply that more ethnic or religious diversity is associated with a higher risk of civil war (Fearon and laitin 2003: 78).

There are disagreements on the effect of ethnicity on the likelihood of civil war. To Collier and Hoeffler (2004) ethnic and religious diverse organizations make collective action more difficult, thereby decreasing the efficiency of rebellion. An increase in ethnic heterogeneity can initially increase potential conflict, but after a certain point more ethnic groups can make collective action more difficult. To Collier and Hoeffler (2004) the argument about ethnic diversity relates to coordination of mobilization. The likelihood of civil war decreases in diverse societies because it becomes harder to coordinate rebellion, and is supported by their findings. Only when one group is dominant, i.e. make up the majority, does it have adverse effects. Findings in the literature diverge considerably. Sambanis (2004) and Hegre and Sambanis (2006) find that ethnic heterogeneity increases the likelihood of internal armed conflict, but not so much civil war. Others, such as Blimes (2006) conclude that ethnic heterogeneity *indirectly* affects the likelihood of civil war, but have no significant relationship with the outbreak of civil war. According to Horowitz (1985) the relationship between ethnic diversity and civil war is non-monotonic; "*there is less violence in highly homogenous and highly heterogeneous societies*" (Montalvo & Reynal-Querol 2005: 304).

## Population

A large amount of research has found population size to be a significant and positive predictor of civil war (e.g. Sambanis 2001; Anyanwu 2002; Collier and Hoeffler 2002, 2004; Fearon and Laitin 2003). Few studies find opposing results (e.g. de Soysa and Wagner 2003: 31). The hypothesis that a larger population increases the likelihood of civil war is often traced back to Malthus (1798). He argued that because there is a fixed supply of (fertile) land, a population increase will lead to reduced per capita output of agricultural products. Thus, at a certain population level there will be a struggle for existence because all beings need nutrition. Along the same lines Homer Dixon (1999) linked population size with civil war through its effect on the environment. A larger population will have a larger environmental footprint causing competition over reduced land, resources and livelihood. Disagreements around the empirical evidence for this resource scarcity conflict nexus still remain (see Urdal & Raleigh 2007).

Collier and Hoeffler (2004), finding a significant and positive relationship between population and civil war, claim the link can be understood as matter of rebel supply. A larger country will have more readily available and cheaper recruits than smaller countries. The greater diversity in large countries also increases rebel chances of finding "like-minded" individuals to join their struggle. Finding the same results, Fearon and Laitin (2003) argue that large populations will reduce governmental control of local activity. Controlling a polis and maintaining stability is more difficult in a large country, than in a small country. I believe it is also important to view many findings in light of the methodology and operationalization employed because the likelihood of a large country reaching a certain battle-related death *threshold* is simply higher than in a small country.

## 3.3 Geography

## Mountainous Terrain

Apprehension of the importance of geography for conflict is perhaps as old as the art of war itself[9]. Nevertheless, there is still debate concerning the impact of geographical characteristics and terrain on the likelihood of civil war. The most debated issue is the effect of mountainous terrain. Terrain-based arguments suggest that rebel groups are better able to commence and

[9] "*We are not fit to lead an army on the march unless we are familiar with the face of the country—its mountains and forests, its pitfalls and precipices, its marshes and swamps*" (Sun Tzu [6th Cen. BC] 2002:89)

sustain fighting while evading defeat by the state if they operate in heavily mountainous terrain. Some have extended this to also include heavily forested terrain (Aas et al. 2007). Controlling strategic mountain passes may also offer strategic advantages with regard to communication and logistics (Buhaug et al. 2009: 547). However, it remains unclear whether rough terrain explains the outbreak of civil war. A study by Buhaug and Rød (2006) using disaggregated data focused on whether fighting actually occurred in mountainous terrain. They found that conflicts are more often located near borders or capitals, and not in mountainous terrain. Despite their findings they can not rule out the possibility of mountains providing a safe haven from which rebels may launch operations in other locations. Moving away from the strategic and tactical logic of insurgency, Hendrix (2011) argues that terrain affects state capacity. Drawing on fiscal contract theory, he argues that rough terrain impacts state ability to generate revenue, by increasing the costs associated with tax collection. Less tax collection in turn leads to weaker state capacity.

## 3.4 Political

### Regime type

Regime type can be related to opportunity of rebellion. One argument is that inconsistency of political institutions increases the likelihood of civil war. It is particularly those regimes that are in an intermediary phase from autocracy to democracy that experience high levels of internal conflict because it mixes mass politics with elite politics. Such transition periods present a highly volatile environment whereby people are able to mobilize, raise their demands and challenge the governing. But at the same time, these regimes, often termed anocracies, lack the institutionalized means for accommodating such expressions. The result is an explosion of activism (Stockemer 2010: 263)(Gurr 1993: 176).

Why are democracies less prone to civil war? It is commonly accepted by the liberal peace theory that democracies do not fight each other, but research has shown that democracies also are less inclined to fight themselves. Krain and Meyers (1997: 110) note that the mechanisms which govern "*states` domestic and international war/peace decision*s" are the same. Democracies are more pacific in their internal relations. People are able to participate in democratic processes and responsiveness makes resolution of conflict without violence possible (Ibid). An often-cited source of evidence for this peaceful co-existence within democracies is Rummel (1995). Focusing on democide he concludes that "*the more*

*democratic the less domestic collective violence*" (Ibid: 25). Though Rummel concludes that the same can not be said about autocracies, Muller and Weede (1990: 646-647) suggest that full-blown democracies *and* autocracies alike are less likely to experience political violence than anocracies. Using a rational choice framework they conclude that:

> "*Under a highly repressive regime (autocracy) it is likely that opportunities for collective political action of any kind will be low, that the probability success will be negligible, and that costs will be high. Rational actors who wish to contest the policies of a government are likely to think better of it. Under a non-repressive regime, it is likely that opportunities for collective political action of any kind will be high, that the probability of success of peaceful collective action will typically be higher than that of violence, and that the cost of peaceful collective action will be much lower than those of violence… Under a semi-repressive regime it is likely that opportunities for collective action will be available to some extent that the probability of success of peaceful collective action typically will be negligible, and that violent action therefore may be preferred.*"

Other researchers also point out how autocracies are likely to respond to disobedience with brute and harsh repression (e.g. Davenport 1995). These assumptions about capacity and incentive for violence in different regimes have lead many scholars to argue that the relationship between degree of democracy (or autocracy) is non-linear and non-monotonic. More specifically, the relationship between degree of democracy and civil war has the shape of an inverted-U, on a democracy-autocracy scale. The greatest risk of violence resides among anocratic states that combine insufficient repressiveness to deter violence and insufficient political openness to encourage or facilitate nonviolent activities (Gleditsch & Ruggeri 2010).

The hypothesis that anocracies, or inconsistent regimes, are more war-prone is to a large extent supported in the literature on civil war[10]. Studies doubting the relationship are few and far between. Collier et al. (2003: 64-65) argue that the relationship between anocracies and civil war may be spurious, because "*partial democracies have other characteristics such as low income that increase the risk of conflict*". At some point around USD 750 per capita income, democracies start to show less conflict than autocracies. Hegre and Sambanis (2006: 521) discredit any assumption that this relationship is not robust. Using various measures of regime type in relations to civil war they conclude that the positive correlation between anocracies and civil war onset is robust.

[10] However, there are debates about the treatment of autocracies as a homogenous group. See e.g. Fjelde (2004)

## Political stability

Rebels can be strategic, meaning they may be more likely to resort to violence when the odds of achieving desired goals are higher. Thus, we would expect that the likelihood of encouraging insurgent violence increases when the state is weak (Gleditsch & Ruggeri 2007: 9). The degree of weakness or instability is often classified based on whether a regime in the end turns out to collapse or not. This is a *post hoc* determination that can only be made after the fall, while it is not necessary for a state to actually fully collapse or fall to encourage rebellion. Nevertheless, while *ex ante* certainty about whether a regime will fall can not be known, it is not impossible to argue that insurgent groups can recognize instances when leaders are likely to be weak. Gleditsch & Ruggeri (Ibid: 4) argue that "*most literature on mobilization has focused on the role of a decline in state strength as an indicator of political opportunity structures*". To Skocpol (1979) and Tilly (1978) the concept of state weakness was important in explaining how mobilization occurred. The emphasis of Skocpol (1979) was on rebels' opportunities rather than grievance. Further, political opportunity structure (POS) theories often highlight the importance of certain events or changes that create a momentum for protesters (Ron 2005).

Fearon and Laitin (2003) point out that when a country is politically unstable it signals that a central government is weak and disorganized. This provides opposition groups with opportunities to rebel. They argue that the risk of civil war onset increases when there is "*political instability at the center, which may indicate disorganization and weakness and thus an opportunity for separatist or center-seeking rebellion*" (Ibid: 81). However, a credible criticism of the arguments about political stability and civil war is that instability is really just a characteristic, offshoot or after-effect of civil war. Some question whether civil war per definition entails an authority vacuum or lack of governmental control, and thereby imply that civil war necessitates political instability. In other words, there can be no civil war without political instability. However, this diverges from recent knowledge obtained from developments of geo-referenced data. According to Raleigh et *al.* (2010) the average percentage of area affected by civil war is approximately 48%. And the average amount of territory with repeated fighting is substantially smaller at 15%.

In a study of state weakness, focusing on regular and irregular leadership change, Gleditsch & Ruggeri (2007) found that leadership changes can be used to devise independent measures of

state strength. They argue that *irregular* leadership changes are associated with civil war onset. In instances of irregular transitions, rebels eye an opportunity to rebel. Dixon (2009: 718) claims that there is little disagreement on the relationship between regime change and civil war onset: "*the disagreement is over the strength of the relationship, not its direction – regime change is dangerous"*. Civil wars do not come into being without reasons. Might-be rebels are likely to calculate the outlook of achieving their goals before resorting to violence. One can envisage, everything else being equal, that when political instability commences a state is more likely to become targeted because rebels have a greater opportunity to win.

What is political stability, and how is the concept different from conflict? As qualitative phenomena, political instability is difficult to measure in quantitative terms. The same political situation in a country may be characterized as stable or unstable, depending on which definition is utilized. A common method of measuring political stability is to record perceptions of stability or certain kinds of political events, such as coup d'état, political violence, constitutional crisis, corruption in high office, assassination of political leaders, and civil disobedience. A challenge with this is the assumption that they all claim to have the same net effect in space and time. And further, why consider these political acts or phenomena and not others? There is a lack of consensus in the literature about one definition or way of viewing political instability that is superior to its alternatives (Miljkovic and Rimal 2008: 2455). Perhaps its meaning is so self evident that "*it is unnecessary to devote much time to the concept*" (Dowding & Kimber 1983: 229). Hurwitz (1973) identified five distinct approaches to stability; (1) stability as the absence of violence; (2) stability as governmental longevity/endurance; (3) stability as the existence of legitimate constitutional order; (4) stability as the absence of structural change; (5) stability as a multifaceted societal attribute.

The fourth approach, political stability as the absence of structural change, is perhaps the most rigorous and clear definition. A system is seen as stable when it deflects changes in its basic structural arrangement/configuration (Hurwitz 1973: 457). It is the continuity or persistence of form that differentiates stable politics from those unable to maintain their pattern in the face of threats from the environment. "*A country will either be free of structural change, in which case it is classified as stable, or its basic patterns are changed and thus identified as unstable* (Hurwitz 1973: 457). Claude Ake (1967) in his "A Theory of Political Integration*"* noted that "*we may say that the political system is stable when the impact on the system of the dysfunctional processes generated by the system and the environment are neutralized to the extent of keeping them from altering the structure of the political system*" (quoted in Hurwitz

1973: 456). Of course there is a challenge in defining exactly what "structural change" is. In order to clarify this I refer to Dowding and Kimber's (1983) elaboration on political stability.

There are different ways to react when a threat appears, and systems, depending on their characteristics will react differently. The notion of forced change is essential to the idea of structural change/instability. Change that is voluntarily accepted by any political object is not evidence of instability, even if the change results in a complete discontinuity. It follows that the definition is dichotomous. A system is either stable or unstable. There are no degrees of stability, only degrees of *contingencies* threatening the stability. These forces, contingencies acting on systems, governments etc. are of enormous quantity and variety. Some have structural implication, and others do not. Only the ones with potential for structural alterations are to be considered as relevant contingencies. Political stability is '"*…the state in which a political object exists when it possesses the capacity to prevent contingencies from forcing its non-survival"* (Dowding and Kimber 1983: 238). This means that it withstands any change in one or more of that object's criteria of identity, whether minor or major. So, "*the survival of any given political object consists in the continuity of those elements by which that object is identified*" (Ibid: 237).

# Chapter 4. Natural Resources and Civil War

In this section I discuss the relationship between Collier and Hoeffler's (2004) greed-motivated rebellion and natural resources, and base my main hypotheses on their arguments. Then I attempt to substantiate the possible implications of natural resources for economic and institutional performance, while relating this to the risk of civil war. The last part addresses the possible mitigating effect of corruption on the likelihood of civil war. This is done by a presentation of the often-cited Rentier Theory, which can be said to profess a reduced risk of greed-motivated rebellion in the presence of natural resources due to corruption.

## 4.1. Natural resources and Greed

Some argue natural resources destabilize countries, and lead to an increased risk of civil war due to greed. The notion that natural resource induces opportunities (greed) and economic incentives for violent rebellion was formulated by Collier and Hoeffler in a series of papers; Collier and Hoeffler (1998), Collier (2000), Collier and Hoeffler (2002) Collier and Hoeffler (2004). They built their argument on an economic approach to conflict developed by Grossman (1991; 1999) and Hirschleifer (2001). Their model assumes rational actors which depend upon self-interest as preferred behavior. Rebels are therefore thought to be a product of greed, when presented with the opportunity to rebel. Moreover, Hirschleifer (2001) argues that greed motivates rebellion because of the so-called Machiavelli theorem; *"no one will ever pass up an opportunity to gain a one-sided advantage by exploiting another party*" (quoted in Collier and Hoeffler 2004: 564). Hence, it is similar to the mechanisms driving rent-seeking, namely enriching oneself by increasing one's share of a fixed amount of wealth instead of attempting to create one's own wealth. The greed model, in very simple terms, is interesting because it adds to, and in part moves away form such common understandings of conflict onset as ethnic contest, income, regime type, and social and political grievances. In their research Collier and Hoeffler (Ibid: 26) find a strong and significant effect of primary commodity export on the risk of civil war, and conclude that *"…primary commodity exports is the largest single influence on the risk of conflict*" (Collier and Hoeffler 2000: 26). Natural resources are a "prize" that encourages would-be rebels to spend time and resources to grab the "prize", and thereby generate violent rebellion. Natural resources cater to the incentive of

state capture and/or offer rebels extraordinary favorable circumstances for funding and financing their rebellion.

Collier and Hoeffler (1998) discuss the rebellion-inducing mechanism of "loot". Presented with the possibility of extracting and selling the natural resources, rebel organizations are more likely to start a civil war to seize or keep "loot". They may also engage in extortion of the companies or organizations in control of the extraction. Natural resources are location specific, making them highly exposed to such strategies. In contrast, if rebels attempt seizure or extortion of manufacturing firms, the firms may relocate their business elsewhere or simply stop production. Resource extracting firms cannot relocate. Often they will make payments to rebels while still maintaining a profit (Ross 2003). Rebel organizations take up arms when the revenue from holding power over natural resource revenue outweighs the risks of rebellion. Accordingly, Collier and Hoeffler`s assumptions are similar to that of Grossman (1999: 268-269) who argues that rebel leaders are entrepreneurs who recruit, deploy and compensate insurgents through looting, rendering insurgents "*indistinguishable from bandits and pirates*". Interestingly, such greed motivated rebels may at times use varying excuse for engaging in conflict over resources, such as taking advantage of people`s grievances (Le Billon 2001).

It is also interesting to note that some argue that the end of the Cold War in many instances also marked an end to large-scale support from the Soviet Union and Western powers to states and opposition groups (de Soysa and & Neumayer 2007). This could perhaps have made it more urgent for opposition groups to engage further in resource "plunder" to compensate for loss of external support. Further, outsiders may have a substantial importance for the effect of civil war in yet another way. Humphreys (2005) claim that instead of just greed from internal rebels, the existence of natural resources also create motives for third parties – states or corporation - to take part in or foster civil conflict, in what he calls the *greedy outsiders mechanism*. The intensification of the civil war in the Democratic Republic of Congo resulted in part from the meddling of neighboring states seeking raw materials (Humphreys 2005: 511).

If greed is the mechanism through which natural resources cause conflict, then one can perhaps also argue that secessionist sentiment will grow in the regions where resources are located. From an opportunity perspective a resource-rich region might be encouraged to fight for independence if they believe the formation of a separate state would make them richer. The inhabitants of resource-rich areas also tend to bear much of the cost of extraction; through environmental costs, land expropriation, displacement, influx of labor from other parts of the

country. Table 2 lists examples of secessionist civil wars in regions that have large amounts of resources (Ross 2003).

Addison et al. (2003: 369) addresses a model explaining the concept of "*comfortable military stalemate*", whereby the belligerents not always want outright victory. Instead they might prefer war to either peace or all out victory. It is not impossible for both sides in a conflict to appropriate substantial wealth from perpetuating war. Victory may lead to demobilization and perhaps loss of accumulation opportunities, and so " *the result is often an avoidance of total war and instead a form of conflict (low-intensity) that minimizes direct losses (thereby reducing the cost of conflict to the belligerent) and increases the direct gain (booty)*" (Ibid: 369).

**Table 2.** *Resources and Secessionist Movements.*

| Country | Region | Duration | Resources |
|---|---|---|---|
| ***Angola*** | Cabinda | 1975- | Oil |
| ***Myanmar(Burma)*** | Hill tribes | 1949- | Tin, gems |
| ***Congo, Dem. Rep.*** | Katanga/Shaba | 1960-65 | Copper |
| ***Indonesia*** | West Papua | 1969- | Copper, gold |
| ***Indonesia*** | Aceh | 1975- | Natural gas |
| ***Morocco*** | West Sahara | 1975-88 | Phosphate, oil |
| ***Nigeria*** | Biafra | 1967-70 | Oil |
| ***Papua New Guinea*** | Bougainville | 1988- | Copper, gold |
| ***Sudan*** | South | 1983- | Oil |

Source: Ross (2003: 32)

If rebels cannot loot the natural resources directly, they may offer the valuable resources through future exploitation rights and thereby solve financing problems. When would-be rebels lack the necessary funding, but still have a chance at acquiring control over the resources, these "booty futures" can be sold off to either companies or governments. This money can in turn be used to pay rebel salaries and buy arms, giving them the capacity to "*capture the promised resources*" (Ross 2003: 22). The danger of such booty futures is its tendency to benefit the weak side. Selling natural resource under one`s control indicates that their position is strong, since they control a valuable piece of land. If forced to sell resource

futures it implies a weak position, since desired but not-yet-captured resources must be sold. Selling booty futures is an instrument of the weak, funding the start of a civil war that may otherwise never have begun, or lengthen wars that should have ended (Ross 2003).

Yet, despite the possible dire consequences natural resources have for civil war, their effect is most dire at medium levels. Collier and Hoeffler (2004: 574) find an inverted U-shaped relationship between primary commodity export and the likelihood of civil war onset. They claim that at very high levels of resource dependence the incumbent has enough funding at hand to suppress the opposition, but at medium levels the power asymmetry is not large enough to deter rebellion. Only when sufficiently funded by resource can the rulers control its citizens or invest in a repressive apparatus to curb the potential of civil disorder. The risk of conflict peaks when primary commodity export constitutes around 33% of GDP (Collier and Hoeffler 2004)[11]. I elaborate the relationship between natural resources further in the following sections. Based on the greed approach I hypothesize the following:

> **Hypothesis 2:** *There is an inverted U-curve relationship between natural resource dependence and civil war onset, ceteris paribus.*

## 4.2 Further linking natural resources and civil war

"*Libya: Like Norway, but warmer*"

Dan Hind, OP-ED, Al-Jazeera English, September 07, 2011[12].

Motivated by the simple, yet effective theory of Collier and Hoeffler, I seek more width and depth into the relationship between natural resources and conflict. Therefore I use the next sections to elaborate other substantiating explanations of this supposedly negative link between natural resources and civil war.

[11] At 26% of GDP in Collier and Hoeffler (2002)
[12]

### 4.2.1 Economic developments

Ironically, high levels of endowment from nature can cause less growth for a country (Auty 2001: Gelb 1988; Ross 1999; Sachs and Warner 2001). Sach and Warner (2001: 837) claim the curse of natural resources on growth is "*a reasonably solid fact*". True, the discovery of natural resources most likely provides short-term wealth and growth, often quite considerable, but in the long-term it appears to slow down economic growth. For example, among the larger economies in East Asia, the countries with little raw material (Hong Kong, Singapore, South Korea, and Taiwan) have done better than their resource-rich counterparts (Malaysia and Thailand) (Gylfason 2001). It is not the resource itself or its physical characteristics per se that cause lower growth. Rather it is the rippling effects on other economic variables that in the end cause lower growth. It tends to crowd out other exports and raise the domestic prices (inflation), which again reduces economic growth by crowding out primary and secondary industry. Such effects often reduce, or prevent the formation of export industries.

It may very well also be that "bad governance" is what links natural resources and low economic growth (Ross 1999: 305). In a study of natural resources in Nigeria Sala-i-Martin and Subramanian (2003) conclude that Nigeria, like many other oil and mineral producing countries, has suffered lower growth rates due to poor institutional quality caused by oil. Nigeria has earned vast amounts of money in oil revenue following the 1970s, but per capita income declined in the same time by more than 15 percent. The amount of people living on less than 1$ a day quadrupled from 19 to 84 million, making up more than half of the population (Ibid). Low growth has been the real legacy of oil in Nigeria. As discussed in chapter 3.1, slow growth can impact the risk of civil war by making it more attractive for people to rise up when conditions worsen.

Just as natural resources affect growth, it can have a negative effect on development and poverty. Ross (2001c) found that living standards in oil and mineral dependent states are exceptionally low – lower than they should be given their per capita incomes. The greater the mineral dependence a country has, the greater the poverty among its population. Table 3 lists the ten most mineral dependent economies in 2008 and their corresponding score on the Human Development Index (HDI).

**Table 3**. *Top 10 mineral dependent countries in 2008, and their corresponding ranking on the Human Development Index.*

| Country | Mineral % GNI | HDI ranking 2008 |
|---|---|---|
| *Mauritania* | ***22%*** | **140** |
| *Papua New Guinea* | ***19%*** | **149** |
| *Chile* | ***13%*** | **40** |
| *Zambia* | ***12%*** | **163** |
| *Congo Dem. Rep* | ***9%*** | **177** |
| *Mongolia* | ***8%*** | **112** |
| *Peru* | ***6%*** | **79** |
| *Morocco* | ***5%*** | **127** |
| *Togo* | ***5%*** | **159** |
| *Jordan* | ***4%*** | **90** |

*Source: World Bank (2012) and UNDP (2012)*

Though incomplete, the table paints a bleak picture of the situation in mineral dependent states. Only three countries rank among the "best" 100, and all are developing countries. Bad conditions may increase the genuine grievance among the worse off. Poverty carries with it consequences for civil war as "*extreme poverty and poor social conditions also facilitate conflict by providing more readily available combatants*" (Murshed 2002: 389). I discussed more in-depth the link between poverty, development and civil war in Chapter 3.

## 4.2.2 Political and Institutional Developments

"*You give me $18-a-barrel oil and I will give you political and economic reform from Algeria to Iran.*"

Thomas Friedman, OP-ED, New York Times, January 30, 2005

Natural resources can reduce the strength of governing structures and institutions normally meant to accommodate society`s needs. Resource dependent states may generate a less developed bureaucracy. They need not collect (as much) taxes and therefore loose a connection with society (Ross 2001a). Fearon and Laitin (2003) make a similar claim when

they argue that more dependence on natural resources causes state weakness, because the reach of government control decreases. Without the need to tax their populace and less contact with them, they also have less control over them. An immature state bureaucracy is also likely to be worse at accommodating people's needs and provide public goods, which in turn augments the risk of rebellion.

Governments in countries with high levels of natural resources are also exposed to weakness by having less control over the state`s territory. When resources are extracted from peripheral regions and require little expertise, as is the case with certain minerals, it may become difficult for the government to properly rule that region and enforce order. Le Billon (2003a; 2003b) argues that the degree to which rebels may loot a resource is important. So-called lootability increases when resources are distant, *"located in remote territories along porous borders, or within the territory of social groups politically marginalized or in opposition to the extant regime*" (Le Billon 2003b: 33). I discuss this further in chapter 3.4.

Natural resources are also likely to reduce the accountability of governments. Ross (2001a) was one of the first to quantitatively analyze the extent to which theoretical concepts from the Middle East literature on the Rentier Theory extends to a large-N framework. In his work "*Does Oil Hinder Democracy*" he found that on average oil and democracy does not go hand in hand. Governments that receive their revenue from natural resources become less democratic, and therefore less accountable, than countries that get their income from other sources, such as taxation (Ross 2003: 13).

Kennedy (2008: 5) argues that much of the earlier literature on natural resources is like an invers of the endogenous/exogenous democratization literature initiated by Przeworski and his co-authors (Przeworski and Limongi 1997; Przeworski et.al. 2000). Their main finding is a difference between how variables, especially per-capita GDP, affect the probability of democracy being established (endogenous democratization[13]) and how they affect the stability of democracies once they are established (exogenous democratization[14]). Despite the controversy surrounding the findings, their distinction is interesting in light of the previous literature on natural resources. Some argue that non-democracies occur endogenously in oil exporting states by implication of making democracies more vulnerable, and others argue that

[13] Explaining the causes leading to the consolidation of democracy.
[14] Where a set of events, happening randomly, prompts regime changes.

non-democratic outcomes are determined exogenously and stability is amplified by rent from natural resources.

Can economic growth from resource exploitation be compared to other types of economic growth? The fact that higher levels of capital associated with rent from natural resources most often find their way to the governments suggests that comparison might be challenging. Even in cases where the higher levels of capital associated with natural resource rent causes economic growth, it is difficult to compare it to other types of growth. The familiar modernization theories claim that higher levels of economic wealth make a country more likely to be democratic (Lipset 1959). Further, an assumption in the many variants of modernization theory is that wealth from economic growth flows to and results in the advancement of various social groups (Middle Class – Lipset (1959), Working class – Reuschmeyer et. *al* (1992)). However, these assumptions fall short when states are the primary recipients and distributors of increased capital, as is most often the case with natural resources. The chances of capital and labor championing democracy are unlikely when dependence on the state is significant. Instead their economic interest will align with the state´s; "*state dependence, fear, and aristocratic position shape capital and labor´s disposition toward democratization*" (Bellin 2000: 180). States are not value-neutral mediators in social contention, but have their own interests and incentives, often vested in maintaining the status quo. As such, economic growth associated with rent accruing to the state is qualitatively different from economic growth in economic sectors where ownership and employment are more diffusely dispersed, as in primary and secondary industries (Kennedy 2011: 15).

## 4.3. The Rentier Theory

*What are thy rents? What are thy comings in?*
*O ceremony, show me but thy worth!*
William Shakespeare "Henry V" (1632, 4, 1)

In contrast to the Collier and Hoeffler (2004) framework, natural resource dependent states may be able to avoid greed motivated rebellion through corruption. This section sets out to explain and analyze how and to what extent corruption may in fact mitigate the adverse

effects of natural resources explained in the previous section. This is primarily done through discussions on the often neglected proposals of the rentier theory.

What has commonly been labeled the Rentier Theory is often attributed to the works of Beblawi (1990). However, the earliest concept of the Rentier Theory was first presented by Hossein Mahdavy (1970) in a description of pre-revolutionary Iran in 1970. He noted that revenue from petroleum in Middle Eastern countries constituted an external source of rent directly captured by governments, thereby rendering them unaccountable to the citizenry (Haber & Menaldo 2011: 1). Following his work dramatic transformations befell the oil industry in the 1970s: OPEC, the Arab oil embargo of 1973, the fall of the Shah, continued unrest in the oil producing world, massive industrialization and thereby demand in East Asia. In the 1980s Mahdavi´s ideas experienced somewhat of a renaissance in Middle East political and economic literature. The concept has since been adopted by a community of Middle East specialists in discussions on the Arab world. They built upon his ideas creating a more general Rentier Theory made up of certain key concepts: "rent", "rentier economy" and "rentier state". "Rent" was explained in chapter 2.3.

### 4.3.1. The Rentier Economy

Beblawi and Luciani (1990) were interested in the sudden accumulation of wealth among Arab, and especially Gulf, states which have become the example *par excellence* of rentier economies. Beblawi (Ibid 87-88) provides four attributes that determine whether an economy is a rentier economy. First, because all economies to some extent feature rent, it is only in economies where rent predominates one can speak of a rentier economy. A *pure* rentier economy does not exist; it is an ideal type, and thus a matter of judgment.

Second, the economy is highly dependent upon rent originating externally. Therefore sale of e.g. petroleum on a domestic market disqualifies the income as rent. A pure internal rent is contingent upon the existence of a substantial domestic productive sector purchasing and thereby providing the state with rent. Internal rent is like any other situation of domestic payment transfer in a productive economy. External rents, on the other hand, can sustain the economy without the presence of a productive class. I will return to this attribute in discussions on conceptualization and measurement (chapter 4.4).

Third, only the few are engaged in generation of rent (wealth), while the majority is involved in its distribution and utilization. The distinction between generation of wealth and its utilization is not always clear. However, in the case of oil-producing countries "*the role of oil revenues is so overwhelmingly obvious that it can be approximated to be the cause of other activities*" (Beblawi 199:87). An open economy with high levels of foreign trade is not a rentier economy simply because it relies heavily upon the outside world, even if it generates its income from natural endowments (e.g. tourism), because then a large part of society is engaged in the process of wealth generation.

Finally, as concurrent with the aspect of the few, the government is the principal recipient of the rent in the economy. The economic power bestowed upon the few allows them to seize political power in order to eradicate rivalry over the rent. The result of these rentier characteristics is the emergence of a so-called "rentier mentality", inducing a break in the work-reward causation (see section on rent-seeking). Beblawi (1990: 86) caricatures the rentier as an antithesis to Schumpeter`s "entrepreneur" which is dynamic, innovative and risk bearing; reward – income or wealth – is related to chance or situation, rather than work and risk bearing. Reward for a rentier becomes "*a windfall gain, an isolated fact, situational or accidental as against the conventional outlook where reward is integrated in process as the end result of a long, systematic and organized production circuit*" (Ibid: 88).

## 4.3.2. The Rentier State – allocation vs. production states

The rentier state theory asserts a substantial link between the state and the rentier economy, because the prime mover of most economic activity is the state[15]. Social and economic interests conform in such a manner as to obtain a good portion of government rent. Consequently, citizenship becomes a source of economic benefit. Society in turn becomes arranged with different layers of recipients of government rent, giving rise to additional layers of recipients. The entire economic fabric is constructed with hierarchical layers of rentiers, with the government at the top, acting as a kind of rentier of "last resort".

The rent industry provides the incumbent(s) with liquidity to fund its programs without resorting to taxation. Luciani (1990) proposes to categorize states by their productive and

[15] According to Ivanhoe (2000: 6) Seventy-five percent of the world´s oil production, and 90 percent of its reserves are in the hands of state-owned companies.

allocative functions. Unlike a "production state" which relies on taxation of the domestic economy for its income, an "allocation state" does not depend on domestic sources of revenue, but rather *is* the primary source of revenue in the domestic economy. Rents put the government in a position of deciding who should be the grantee of rent. Allocative functions of bureaucracy therefore expand at the expense of extractive capabilities. There is little production and thereby little to tax, and the financial and organizational costs of taxation are also high.

### 4.3.3. Implications of The Rentier Theory

*I call petroleum the devil's excrement. It brings trouble...*
*Look at this locura - waste, corruption,*
*consumption, our public services falling apart.*
Juan Pablo Pérez Alfonso, Venezuelan diplomat, politician, lawyer and a founder of OPEC (1975)

Looking into the writings of Beblawi and Luciani (1990), it is clear that the most important feature of the rentier state is the liberating effect that natural resources has for the government. First, Resource wealth allow governments to spend more on internal security and thereby block people`s political aspirations. Skockpol (1982: 269) noted that Iran became a "*rentier absolutist state*" because the Iranian state changed as the state became increasingly addicted to revenues from the export of oil and gas. Petrodollars allowed the Shah to build up and reward an expanding security force.

Second, massive rent accessible to the government also permits it to purchase consent of the governed in the short-term without paying the political price of imposing taxation over the long-term. Immediately after the state starts collecting taxes, questions concerning the legitimacy of the ruling elite are likely to occur. The well-known expression from the American War of Independence during the 16$^{th}$ century, "*no taxation without representation*", is used to explain the mechanism providing rentier states, or allocation states, with stability. Inhabitants of the colonies in "the New World" refused to pay taxes to England because they had insufficient influence on the political processes. In the oil producing Arab countries of the Gulf, Luciani (1990) claims the same expression can be used by turning it the other way around; "*no representation without taxation*". The people are not forced to pay taxes, but in

return they do not have the privilege of voicing their influence on politics, and as a consequence elites maintain their rule. The Rentier Theory contains no explicit reference to civil war. However, it entails perseverance and survival for the rulers because they obstruct the formation of viable opposition. It emphasizes the creation of a ruling rentier class, an elite wielding financial muscles enabling it to persevere, through 1) repression and 2) buying off the opposition. The next section elaborates on the first.

The predominant large N research on the link between natural resources and conflict has so far focused much on power struggles and the material feasibility of rebellion. Case studies imply that such research has to a large extent neglected the important non-resource factors which may shape rentier systems and "*determine their stability*" (Basedau and Lacher 2006: 22). The model of Collier and Hoeffler does not specify why or if the non-violent forms of rent-seeking are less effective in resource dependent economies than in non-resource dependent economies. In fact, it may be equally conceivable to contend that natural resource rent allow the incumbent(s) to buy off political opponents through corruption and patronage, as envisioned by the rentier theory (Di John 2005: 965).

Among large N studies, few have investigated the consequences of corruption for civil war, and even fewer have looked at the possible interplay between natural resources and corruption for increasing or mitigating the risk of civil war (Fjelde 2009; Basedau & Lay 2009). This is needed because not all resource dependent states experience civil war, and there is lack of consensus for why. For every one resource dependent country affected, two are spared from violence, claims Ross (2003). To my knowledge only *one* large N study has investigated the possible mitigating effect of corruption has on the relationship between natural resources and civil war[16]. Fjelde (2009) found that oil and corruption both *increased* the risk of civil war onset. However, in states where corruption was high the negative effect of oil was actually *reduced*. As concurrent with the Rentier State Theory, elites might distribute rents in a selective manner creating clientelist networks, through which politically important groups benefit from. This way only a minor part of the population is granted access to the revenues through personal ties. The mentality, which occurs as a result of this specific type of income and economy, is often labeled *rent-seeking*. Rent-seeking is enriching oneself by increasing one's share of a fixed amount of wealth instead of attempting to create one's own wealth. Social wealth thereby decreases because resources are expended with no new wealth created

[16] Basedau & Lay (2009) conducted a macro qualitative study on primary commodity exports and corruption.

to replenish the fixed amounts of wealth. This strategy maintains stability by accommodating potential political rivals. Many label this corruption, patronage or clientalism. Sachs and Warner (1999: 48), Gylfason (2001), Papyrakis and Gerlagh (2004: 184) and Aslaksen (2010) all provide strong evidence of a substantial link between natural resources and higher levels of corruption, strengthening the assumption that natural resources induce rent-seeking behavior and corruption. Fjelde (2009: 202) defines political corruption "*as transactions between public and private actors through which collective goods are illegitimately converted into private payoffs*".

#### 4.3.3.1 Corruption, Greed and Civil War

I begin with evaluating how political corruption might *increase* the risk of civil war. There are several ways in which political corruption might increase the risk of conflict. First, the amount of grievance and conflictual demands for political change can increase when corruption is high. This is especially so if the results of corruption are reduced investments, more inequality and negative impacts on economic growth. Corruption is also less likely to benefit the conflict mitigating sectors such as education and health, instead allocating more to certain individuals, groups or the military. If less of the fixed amounts of resources are allocated to e.g. education, then the opportunity cost of rebellion for youth is lowered (Le Billon 2003a: 417). By moving the income from natural resources away from their economically "best" use and thereby halt or obstruct growth, corruption increases the negative sentiments among the population (grievance), especially in marginalized groups. The regime could also loose legitimacy as it avoids the welfare needs of large segments of society (Fjelde 2009). Further, there is also a growing body of scholarly work claiming social and institutional trust decreases with higher levels of corruption (Richey 2010; Anderson & Tverdova 2003).

Secondly, popular support for political change may pick up when corruption is scandalous and perceived to undermine national prestige. The potential rebels or political challengers can legitimately use corruption charges and benefit from popular support (Le Billon 2003a). As Collier and Hoeffler (2004) argue, many rebels motivated by greed use the rhetoric of grievance to gain more support. Similarly, Le Billon (2003a: 418) notes that most coup leaders justify their violent intervention into state affairs by referring to the previous regime's

corruption, "*hoping to shore-up support from the population*". The would-be rulers may in fact just be motivated by the prize of capturing the state and the lucrative corruption rents controlled by the incumbent. This may support Collier and Hoeffler's (2004) greed-motivated rebellion argument. As those in power become ever richer from income obtained through public offices, the incentives to seize public offices for outsiders increase. Further, with substantial corruption in the state's bureaucracy, especially when connected to the military and tax collection, it increases the likelihood of a successful rebellion due to weakened state apparatus, including military effectiveness. Increased rebel chances of victory should stimulate their presence (Jens Christopher Andvig 2009).

Third, employing ad-hoc and non-institutionalized arrangements for allocation of revenue makes the dispersion more exposed to factional pressures and shifting political agendas. Such a system might reinforce efforts to alter policies, and thereby cause political destabilization (Fjelde 2009).

Despite these detrimental effects expected from corruption, there are indeed several relevant and highly actual arguments for why corruption together with natural resource revenue reduces the risk of civil war. Greater patronage may dampen the pressure for change, as governments use their endowments to prevent the formation of independent social groups that could eventually demand political change or rights. This is all the more likely when states, such as resource-rich states, have extra revenue at their disposal (Ross 2003). Because a regime is dependent upon some level of support in order to remain in power, the selective distribution of rents compensates for little or no political concession, according to the Rentier Theory. Ghandi & Przeworski (2006: 2) claim it is possible that "*when the opposition is strong the dictator makes more extensive policy compromises and shares some rents, just enough to prevent the opposition from rebelling*".

I argue that the notion of greed motivated rebellion (Collier and Hoeffler 2004) faces a challenge when there is extensive corruption fueled by natural resource rent. If greed (i.e. acquiring the sources or positions of rent) is the motivation of rebellion, are individuals then inclined to exercise *group violence*? This is both expensive and sacrificial, compared to getting "*into the game themselves*" (Johnston 1986: 474). Of course, shortage of education, wealth or social capital might be a reason for not getting into a bribe-collecting position, and thus chose violent action. But education, wealth and social capital is to some extent also necessary to set up and coordinate an alternative organization. The probability of individual

admittance into bribe-collecting positions should counteract the formation of group action. This mechanism halts the transformation of rent-seeking individuals into rent-seeking violent groups (Jens Christopher Andvig 2008). Corruption redirects the behavior of interest groups away from collective plans of action towards individual rent-seeking. Lam and Wantchekon (2003: 5) note that growth in patronage spending in resource abundant states subsequently causes the population "*to find rent-seeking more efficient than political unrest as a way to induce redistribution*". Hence, the greed mechanism itself may trigger stability in states that are dependent upon resource rents (Bjorvatn & Naghavi 2010: 14). Even if parts of the would-be rebel groups are not able to acquire the rents accruing from corruption, it may be enough for these groups to have some mechanism for sharing corruption rents acquired by members as individual bribes. This would make it unnecessary to utilize violence.

Further, though corruption has a tendency to exclude some segments of society, the losers do not necessarily respond "negatively". The excluded may be unaware of corruption, or not believe the allegations they hear. If they actually perceive the presence of corruption, their response may include: "*apathy, tolerance, amusement, surprise, and/or anger, or attempt to get into the game themselves*" (Johnston 1986: 474). Even though Gylfason (2001: 3) asserts that in general corruption hampers economic growth, he also acknowledges that bribes may in fact speed up the processing of e.g. operating licenses, improve public administration and its efficiency, and "*in doing so encourage economic growth*". Thus the adverse consequences of bad economic performance, such societal upheavals are not necessarily always the end-result of corruption.

By using patronage, attracting allegiance through the provision of private rather than public goods, the ruler can selectively choose supporters, while ensuring that as little as possible of the total wealth is spent. In a study of African systems of governance Bratton and Van de Walle (1994) find that the distinct hallmark of African regimes is neopatrimonialism. The chief executive in neopatrimonial regimes maintains power through personal patronage, rather than ideology or the rule of law. The essence of such neopatrimonial systems is the award by public officials of personal gifts. And in return for material benefits, "*clients mobilize political support and refer all decisions upward as a mark of deference to patrons*" (Ibid: 458). President Omar Bongo of the oil-rich state of Gabon who was the longest serving president in Africa until his death in 2009 serves as a good example. The political dynamics apparent in Gabon cast light on a supposed causal relationship between large-scale distribution systems and stability. The vast corruption prevalent in Bongo's Gabon gave the president a patronage

network centered on him. He managed to balance a power-sharing system comprised of a limited number of important families, and carefully choose to integrate important ethnic groups and powerful political opponents into his closest circles (Basedau & Lacher 2006). This is in line with selectorate theory, which claims that "*in addition to failing to root out corruption, leaders with small winning coalition might endorse corruption as a way of rewarding supporters*"(Bueno de Mesquita 2003: 166). "*Sharing of the spoils*", or political corruption, thus promotes stability (Fjeld 2009: 202).

Clientelism and corruption might also be a reaction to limited institutional foundation for making other guarantees of distribution credible, which is especially likely in weak or non-democratic states (Fjelde 2009: 204). It may be used to overcome an already existing legitimacy gap caused by a weak state apparatus, something that may be highly actual in non-democratic systems of governance. By doing so leaders offer immediate and specific payoffs creating instrumental legitimacy, avoiding demands on the regime's institutions. If there are no real valid alternatives of distribution, which force leaders to keep their promises, then corruption is perhaps the favored policy for regular exchange that allows the government to convince the public of its commitment. Fjelde (2009: 204) claims this might explain why broader segments of society that would otherwise benefit from a more equitable allocation of rent peacefully accept such clientelist conventions.

Corruption, though often associated with bad governance, may in fact reduce the de-stabilizing effects associated with natural resources. Based on the above discussion, corruption fueled by rent from natural resources may actually insulate the regime, provide it with strategic partners and silence the populace. I therefore hypothesize that:

> **Hypothesis 2:** *Corruption reduces the adverse effects of natural resource dependence on the likelihood of civil war.*

## 4.4 Measurement and heterogeneity of Natural Resources

In this section pose three puzzles to the measurement of natural resources in the field of civil war study; 1) Is it arbitrary whether we focus solely on export figures? 2) Is it arbitrary whether we focus on an aggregated measure of natural resources? 3) Is it arbitrary whether we measure natural resource as a share of GDP or in actual levels?

The predominant way of conceptualizing a country's dependence on natural resources has been primary commodity/or oil export-to-GDP (e.g. Collier and Hoeffler 2004; Fearon and Laitin 2003). However, using primary commodity export-to-GDP raises important questions. Imagine a sample of two countries' natural resource exports. One is poor (low GDP) and one is wealthy (high GDP). Export figures will often provide data with an unbalanced numerator, because developing countries often have large numerators. Developing countries only use a small portion of their resource production domestically, which creates high export figures. Rich countries on the other hand consume more of their resources domestically. Though the U.S. produces more oil than Nigeria, Nigeria exports more than the U.S. Measuring natural resource exports indirectly measures the size of the economy (Ross 2010). Would an analysis of the value of *total resource extraction* improve inference? Such a conceptualization presents some validity issues vis-à-vis the Rentier Theory, because the original literature emphasized the *externally* derived income, i.e. exports. But should we still overlook income from domestic sale? The difference between exports and total production can be gauged by investing the divergence in oil figures represented in Table 3. I argue that if it is the degree to which an economy is dependent on a resource, which is important to the natural resource-conflict nexus, then only measuring exports provides at best a poor measure of the size of the resource sectors importance for the national economy[17].

The Collier and Hoeffler (2004) measure also includes re-exports, such as primary commodities shipped through a country but not necessarily produced or extracted within that country. This is problematic vis-à-vis their hypotheses, as the emphasis is on the availability of natural resource in a country, not the characteristics of the re-export sector in an economy.

[17] In defense of Collier and Hoeffler (2002), one argument is that export figures shows an ability to guarantee that the resource in question can be sold. However, Collier and Hoeffler provide no reasons for why resources may not be of interest to domestic merchants and buyers. And in any regards, after seizing the resource rebels may redirect sales from the domestic market to foreign markets.

Humphreys (2005: 522) claim this leads to e.g. Singapore appearing "*as one of the most natural-resource-dependent economies, while Sudan and Burma feature as countries with among the lowest levels of dependence on natural resources*". This is a matter of validity in research design, which is important for any conclusions made. If we are to assess Collier and Hoeffler's (2004) arguments we must reach an improved measurement, and perhaps move away from export figures. A more correct measure would be one that captures a country`s actual domestic production, measured not in export values, but in actual value.

**Table 4.** *The World`s 15 Largest Oil Exporters and Producers in 2008.*

| | ***Oil Export*** | | ***Oil Production*** | |
|---|---|---|---|---|
| **Ranking** | **Country** | **1000 bbl/day** | **Country** | **1000 bbl/day** |
| 1 | Saudi Arabia | 7,635 | Russia | 9,932 |
| 2 | Russia | 5,010 | Saudi Arabia | 9,764 |
| 3 | Iran | 2,523 | United States | 9,056 |
| 4 | UAE | 2,395 | Iran | 4,172 |
| 5 | Norway | 2,184 | China | 3,991 |
| 6 | Iraq | 2,170 | Canada | 3,289 |
| 7 | Kuwait | 2,127 | Mexico | 3,001 |
| 8 | Nigeria | 2,102 | UAE | 2,798 |
| 9 | Canada | 1,929 | Brazil | 2,572 |
| 10 | United States | 1,920 | Kuwait | 2,494 |
| 11 | Venezuela | 1,871 | Venezuela | 2,472 |
| 12 | Netherlands | 1,871 | Iraq | 2,399 |
| 13 | Angola | 1,851 | Norway | 2,350 |
| 14 | Algeria | 1,694 | Nigeria | 2,211 |
| 15 | Libya | 1,580 | Algeria | 2,125 |

*Source: CIA World Factbook.*

### 4.4.1 The Heterogeneity of Natural Resources

In their research and interpretation of their results, Collier and Hoeffler (2004) focus much on certain resources like diamonds, oil and even drugs. Yet some of these commodities are unlikely to be captured by the measure they employ. The primary commodity export-to-GDP ratio is not likely to capture much illegal commodities, and official figures are likely to not reflect the true diamond flows. This is at least the case when states are weak. Further, their measure includes agricultural products[18], while Fearon (2004) argue that the Collier and Hoeffler results are fragile, and that their results stem largely from the fact that oil is a major component of primary commodity exports[19]. Nevertheless, Collier and Hoeffler's (2004) argument for including several types of resources instead of only oil is interesting and appears valid. But their aggregated measurement calls for disaggregation.

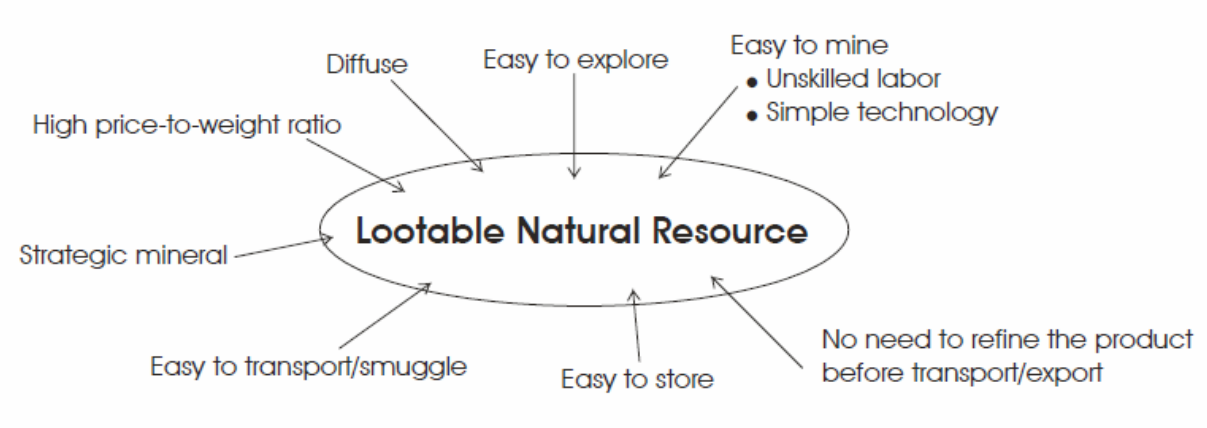
Many researchers have focused much on the effects of oil, and some have excluded other resources when investigating the resource curse. The Rentier Theory concerns primarily oil. However, if what is important is the value of natural resources, why should it be limited to only oil? Why expect oil to be particularly unique? There might in fact be several commodities out there with the same key characteristic of not being derived from taxation, but instead are made available as "windfalls" to the government (Morrison 2005:2). Authors have argued that the literature on oil has relevance for other rent sources, such minerals. Though there are relatively fewer mineral reliant states (Herb 2005), minerals are similar to oil in many ways: 1) they generate rents 2) the rents are generally captured by states via export taxes, corporate taxes, and state-owned enterprises, and 3) mineral extraction employs relatively little labor (Ross 2010). The resource curse can affect states not only in the case of oil, but also for other energy resources such as natural gas, and indeed for mineral resources.

The importance of disaggregating becomes apparent when considering natural resources' specific characteristics and their potential for incentivizing rebellion. There is no agreed upon criteria for determining the lootability of a resource (Lujala 2003: 10). But certain key components appear crucial for a resource's lootability (Figure 2). The location of a resource is important for its lootability because this can determine the degree to which they are accessible to rebels. A resource positioned in distant areas far away from a country`s center might be more easily looted by rebels, than proximate resources. A further distinction can be made

[18] There is no statistical evidence – and very little case study evidence – that links agricultural commodities to either the initiation or the duration of civil war(Ross 2004 : 352).
[19] However, the hypothesized effect of oil by Fearon (2005) relates to state weakness.

between diffuse and point resources. Point resources are those which are concentrated in one specific area, while diffuse resources are spread over a larger geographical area. Diffuse resources are not as easily captured as concentrated resources. It is more challenging for a government to remain in control over diffuse resources, than point resources which are less geographically dispersed.

**Figure 2.** *Aspects making a resource lootable.*




Source: Lujala (2003: 13).

Certain resource can be identified by the naked eye. Others require extensive exploration and are not found by accident. Multinational corporations are therefore often needed for exploration. They have the required skills and are large enough to bear the cost of uncertainty related to exploration. Further, the companies often demand political and economic guarantees for their investments, making it more likely that the state will be involved in the extraction process, thus providing the state with more control over the resource. Such hard-to-find resources are less lootable at the initial stage because of high start-up costs (Lujala 2003).

Ross (2002) argues that natural resources such as alluvial diamonds are more lootable because their extraction requires less knowledge and technology. Other types of resources such as oil often require a skilled workforce and more advanced technology. Such resources can be less vulnerable to direct loot (Lujala 2003).

Refining a resource may be needed before it can be transported to markets. If this can be done locally and with modest tools then it becomes more lootable. However, some minerals need to

be separated from other compounds using advanced equipment, chemicals and skills. Again, this increases the likelihood that the government is able to determine the revenue flow because large companies are needed. Further, resources sometimes need to be stored before transported, which again highlights the differing nature of natural resources. Those that are easily stored are more lootable than those that need special facilities. Gemstone, although small, need a secure location before being transported and sold. Certain minerals with high value-weight ratio are also more lootable (Lujala 2003).

The required transportation to markets also influences the lootability of natural resources. If a resource can be easily transported by for example an individual it makes it easier for groups to get them to a market. However, transportation sometimes require special containers, pipelines, harbors, trains and roads making it more likely that the government will control the flow of the resource and the revenues. The markets for natural resources also impact their lootability. If the resource in question is rare or located in only a few countries the international community is less inclined to impose strict control or sanctions on the resource (e.g. rare earths). When the end use of a resource is flexible, meaning it can be used in many products then finding buyers should become easier. The stability of prices may also influence the lootability, because expected income becomes stable (Lujala 2003).

The heterogeneity of natural resources demands a disaggregation of natural resources when examining the relationship between natural resources and conflict. However, due to limited data availability I restrict the disaggregation to energy resources and mineral resources. Though broad categories, they might still shed light on the different effects of natural resources. I therefore add the following hypotheses:

**H4:** *Energy resource dependence increases the likelihood of civil war onset.*

**H5:** *Mineral resource dependence increases the likelihood of civil war onset.*

### 4.4.2 Dependence vs. Abundance

A country awarded with vast amounts of income from natural resources is not necessarily dependent upon that resource. And also, a country that is dependent upon natural resources is not necessarily rich from those resources. The Collier and Hoeffler's (2002) argument about greed, the literature on rentierism and the resource curse in general have largely neglected the difference between resource *dependency* and *wealth/abundance*, treating them as identical (Basedau & Lay 2009). There are reasons to not treat them as synonymous. On the one hand, total income from a resource provides data on a country's resource *wealth/abundance*. On the other hand income from a resource as a share of total income provides data on a country's *dependence* on that resource.

The importance of distinguishing between the two concepts can be illustrated by looking at e.g. Saudi Arabia and Nigeria (Table 2). In 2001 income from energy resources (oil, natural gas and coal) in Nigeria and Saudi Arabia accounted for approximately 25 and 23 percent of Gross National Income (GNI), respectively. Their dependence therefore was almost equally great. However, the difference in income from these resources is colossal. Saudi Arabia had an income almost four times as large as Nigeria in 2001. It should be mentioned that this is an extreme case in which dependence and abundance diverge. But the pattern can be noticed in many other examples as well. More importantly, what does this tell us, and how can we use this knowledge in further analysis of the resource curse?

**Table 5.** *Dependence and Abundance in Nigeria and Saudi Arabia in 2001.*

| Country | Dependence (Energy rent %GNI) | Abundance (Energy Rent) |
|---|---|---|
| ***Nigeria*** | 25.7% | 110 Bn $ |
| ***Saudi Arabia*** | 23.2% | 420 Bn $ |

Source: World Bank Development Indicators

Mechanisms leading to conflict, as mentioned earlier, might be equally conditioned by abundance and dependence. For example, the arguments concerning negative economic outcome as a result of natural resources exclusively consider countries' dependence on natural

resource. They do not to distinguish between the dependence on and abundance of natural resources. Abundance may in fact *not* lead to lower growth, as it does not necessarily entail a crowding out of primary and secondary industry, which again reduces other types of export.

To the Collier and Hoeffler (2004) framework natural resources constituted possible loot for rebels (greed). They measured this loot, as mentioned earlier, by looking at primary commodity exports as a share of GDP, i.e. dependence. Thus, they assert that the amount of resource wealth would be equally great in e.g. Saudi Arabia and Nigeria, in 2001. But this is not so. There is more resource wealth in Saudi Arabia, than in Nigeria. If insurgents are motivated by how much cash they could divide among themselves after seizing the resources, Saudi Arabia would be more lucrative. I argue that if the incentive to rebel is supposed to grow when the amount of resources available grows, then abundance is an equally, if not more appropriate measure[20].

Abundance might also be relevant when considering the hypothesized curvilinear relationship presented by Collier and Hoeffler (2004). The proposal is that the effect of natural resources is most dire at medium levels because at low levels the possible loot is small and at high levels the rulers are sufficiently funded to control citizens or invest in a repressive apparatus to curb the potential of civil rebellion. The level of dependence *per se* entails little about the capacity for investing in a repressive apparatus. If fighting rebels or repression costs, then a measure of wealth should be more able to capture a government`s capacity for halting rebellions. Thus, the expected inverted U-shaped relationship between natural resources and civil war may be also be measured by abundance, and not only dependence. I therefore hypothesize the following:

> **H2b:** *There is an inverted U-curve relationship between natural resource abundance and civil war onset.*
>
> **H4b:** *There is an inverted U-curve relationship between energy resource abundance and civil war onset.*
>
> **H5b:** *There is an inverted U-curve relationship between mineral resource abundance and civil war onset.*

[20] To the outsiders' mechanism (Humphreys 2005), it is perhaps not the per capita amount that matters, but rather the absolute amount, possibly relative to regional/global scarcity.

Successfully pursuing the strategies outlined in the section on the Rentier State appears at least equally contingent on wealth and dependence. Large-scale distribution or clientelist networks require vast amounts of revenue per capita. The argument about sharing the spoils to avoid extensive policy compromises available (Gandhi and Przeworski`s 2006) is also contingent on the amount of capital. Dependence does not have the same impact on the provision of private goods to selectively choose supporters. As state revenue increases they are increasingly successful in pursuing quiescence, which means that it may be the level abundance, not just the level of dependence that matters for successfully pursuing corruption. That is to say, a country may be both dependent *and* abundant, but using wide-scale corruption requires access to large funds, thus I add the following hypothesis:

> **H7b:** *Corruption reduces the adverse effects of natural resource abundance on the likelihood of civil war.*

An abundance measure of natural resource might be less vulnerable to reversed causality than measurements of natural resource dependence. Dependence on natural resources can increase because of civil war if other sectors of the economy shut down or flee the country, leaving the extracting sector as the dominant one because it is location specific and therefore cannot move easily (or at all). Ross (2004) argues that lagging the independent variable may prove insufficient, because it does not eradicate the threat of reverse causality: "*civil wars can be preceded by years of low-level violence that drives off manufacturing firms, producing a higher level of resource dependence before the conflict officially commences*". Hence, I believe it is valuable to investigate the different measures further. However, I would argue that both abundance and dependence may face some endogenity problems because extraction of resource may increase when an incumbent is faced with rebellion or a threat of rebellion. As the leadership experience threats to its grip on power it may increase production in order to buy more support from the governed or perhaps purchase a greater repression apparatus. No measurement is without challenges.

# Chapter 5. Methodology

I use this chapter to account for the methodology used to test the hypotheses presented in the previous chapter. I also discuss the nature of quantitative research, challenges facing researchers and possible remedies.

## 5.1 Quantitative or Qualitative methodology?

A reason for social sciences' strength is the complementary use of both qualitative and quantitative methods. But for a long time, social scientists have debated the advantages of case studies versus statistical studies, area studies versus comparative studies, and "scientific" studies of social phenomena using quantitative methods versus "historical" investigations relying on a contextual understanding. Researchers of one method sometimes accuse the other of overlooking something. However, both methods have the same objective: scientific inference (King et *al.* 1994). The differences and contrasts between the two traditions are many, and can be elegantly framed across the ten different criterion presented in Table 3. It is important to identify the advantages and challenges that come with quantitative research before commencing the analysis and reach conclusions. Not knowing the limitations of the methodology employed can retard any conclusion.

Qualitative researchers normally start with cases (or events) and then move backwards towards the causes, and adopt a "causes-of-effect" approach in explanations. In contrast quantitative studies employ an "effect-of-causes" approach. The goal is to estimate the average effect of one or several causes across a population of cases. The two approaches are not incompatible, but rather complementary. An inference about an outcome in a smaller number of cases can lead one to question whether such an inference is applicable to a broader scope, thus stimulating a large-N analysis. Similarly, results from statistical analyses about "effect-of-causes" may encourage an inquiry into whether the results make sense in terms of the history of individual cases. Mixed method studies are exemplary in combining these complementary methods.

In qualitative research most are occupied with necessary and/or sufficient causation. Meanwhile, on the quantitative side the analyst seeks to identify *correlation* between events. This has lead many to view statistical research as flawed because causation is mistaken with correlation. But the picture is often not that simple. Statistical analysis identifies causes that

on average affect an outcome across a large population (Mahoney & Goertz 2006: 232). The results of statistical analyses can thus predict probabilistic causal relationships (King et *al.* 1994: 87). Further, statistical analysis tries to estimate the effects of individual causes, while qualitative research primarily estimates the impact of a combination of variables, and seldom focus on the effects of individual variables.

Another contrast between qualitative and quantitative methods is attributed to the concept of equifinality i.e. multiple causation (George and Bennett 2005). It is based on the idea that there are multiple causal paths to the same outcome, e.g. civil war. In qualitative work there are normally only a few possible causal paths to a certain outcome. In contrast, implicit in statistical models there may be "*thousands, if not millions, of potential paths to a particular outcome*" (Mahoney & Goertz 2006: 237).

A strength of large N studies is the ability to generalize. In broad terms qualitative research, such as case studies and small N, has an advantage in its knowledge and analysis of "thick" data (internal validity), while quantitative studies derive much strength from the ability to generalize (external validity). One implication of this is that qualitative research tends to be more fragile, while statistical analyses are often robust, and results will not be "*dramatically influenced by modest changes in scope or population*" (Mahoney & Goertz 2006: 238).

Case studies of a particular event have often been criticized for choosing cases based on the dependent variable (Geddes 1990), and this is particularly a critique within the field of conflict studies (King & Zeng 2001). However, in qualitative researchers' defense, they often argue that cases are chosen because they are substantially important cases. In the qualitative tradition the researcher might pursue "most likely", "least likely" or "critical" cases. Meanwhile, the quantitative researcher includes the entire population of interest (or a random selection). There are no *ex ante* more important cases, each case carries the same weight.

Applying a quantitative approach to the study of civil war is of course riddled with challenges (I discuss some of these in Chapter 5.2.2). Data is often aggregated with states as the unit of analysis creating a distance from specific local conditions. However, this distance from specific conditions is also an advantage of large-N studies. Conducting field research in conflict zones or areas that recently experienced conflict is challenging for several reasons. Collecting and analyzing accurate data becomes difficult because of the absence of impartial data from media sources, the factional nature of information compiled by organizations operating in the area, the difficulty of establishing who are representative informants, and the

obvious logistical challenges (Wood 2006: 373). Collier (1999) notes that e.g. the actors in a conflict can influence narratives of conflict:

> "*…I am simply arguing that since both greed-motivated and grievance-motivated rebel organisations will embed their behaviour in a narrative of grievance, the observation of that narrative provides no informational content to the researcher as to the true motivation for rebellion. To discover the truth we need a different research approach. The approach I take, which is the conventional one in social science, is to infer motivation from patterns of observed behaviour. If someone says `I don't like chocolates', but keeps on eating them, we infer that she really likes them, and the question of why she says the opposite is then usually relegated to being of secondary importance*" (Collier 1999: 1).

**Table 6.** Contrasting Qualitative and Quantitative Research

| Section | Criterion | Qualitative | Quantitative |
|---|---|---|---|
| 1 | Approaches to explanation | Explain individual cases; ''causes-of-effects'' approach | Estimate average effect of independent variables; ''effects-of-causes'' approach |
| 2 | Conceptions of causation | Necessary and sufficient causes; mathematical logic | Correlational causes; probability/statistical theory |
| 3 | Multivariate explanations | INUS causation; occasional individual effects | Additive causation; occasional interaction terms |
| 4 | Equifinality | Core concept; few causal paths | Absent concept; implicitly large number of causal paths |
| 5 | Scope and generalization | Adopt a narrow scope to avoid causal heterogeneity | Adopt a broad scope to maximize statistical leverage and generalization |
| 6 | Case selection practices | Oriented toward positive cases on dependent variable; no (0,0,0) cases | Random selection (ideally) on independent variables; all cases analyzed |
| 7 | Weighting observations | Theory evaluation sensitive to individual observations; one misfit can have an important impact | All observations are a priori equally important; overall pattern of fit is crucial |
| 8 | Substantively important cases | Substantively important cases must be explained | Substantively important cases not given special attention |
| 9 | Lack of fit | Nonconforming cases are examined closely and explained | Nonsystematic causal factors are treated as error |
| 10 | Concepts and measurement | Concepts center of attention; error leads to concept revision | Measurement and indicators center of attention; error is modeled and/or new indicators identified |

Source: Mahoney & Goertz (2006: 229).

## 5.2 Logit Analysis

The dependent variable in my analyses (Y) conflict onset is a dummy variable taking the values 1 (onset) and 0 (no onset), and it is not possible to predict values of Y outside the 0-1 intervals. I therefore use a maximum likelihood logistic model, where objective is to estimate how the risk of civil war onset is affected by changes in the independent variables. In this case the independent variables are natural resource and several control variables. Using logistic regression we can estimate the log-odds of onset for different values of the independent variables. The odds of onset for country *i* in year *t* is the probability of onset ($P_{it}$) divided by the probability of onset ($1-P_{it}$). The logarithms of the odds have the desired property of not being restricted from 0-1, but cover -∞ to +∞. The logistic model can simply be written:

$$L_{it} = Log\ (P_{it} / (1-P_{it}) = \beta_0 + \beta_1 X1_{it} + \beta_2 X2_{it} + \ldots + \beta_k Xk_{it} + e_{it}$$

Where β 0 is the model's intercept, $\beta_1$, $\beta_2$... $\beta_k$ are the coefficients to be estimated for the corresponding $X_1$, $X_2$,…, $X_k$ independent variables, and $e_{it}$ is the stochastic error term. Each coefficient (β) measures the change in log-odds of civil war onset (having value 1) for one unit increase in the corresponding independent variable (X), all other independent variables constant. The model for natural resource dependence and control variables is specified as:

$$\textit{Civil War Onset}_{it} = \alpha + (\beta\ \textit{Natural Resource \% GNI (c)})_{t-1} + (\beta\ \textit{Natural Resource \% GNI (c)})^2_{t-1} + (\beta\ \textit{Political Instability})_{t-1} + (\beta\ \textit{GDP per capita (log)})_{t-1} + (\beta\ \textit{Growth(log)})_{t-1} + (\beta\ \textit{Population(log)})_{t-1} + (\beta\ \textit{Ethnic Fractionalization}) + (\beta\ \textit{Religious Fractionalization}) + (\beta\ \textit{\%Mountainous Terrain(log)}) + (\beta\ \textit{Time Since Last Onset}) + (\beta\ \textit{Spline 1}) + (\beta\ \textit{Spline 2}) + (\beta\ \textit{Spline 3}) + e_{it}$$

The dependent variable Civil War Onset changes when I use a lower intensity threshold for coding conflict. Likewise, the right-hand side variables change when I use the abundance measure, or a disaggregated measure of natural resources. Due to the logarithmic

transformation, interpretation of the regression coefficients is somewhat complicated, especially compared to regular OLS regression. To make interpretation of correlation between variables more intuitive I can utilize odds ratio instead of log odds. The odds ratio measures the relative change in the odds of civil war onset (having the value 1 in the dependent variable), when controlled for all other variables. Odds ratios represent the antilogarithms of the regression coefficient (log odds).

### 5.2.1. The Assumptions of Logistic Regression – Challenges and Solutions

By employing a logistic regression I make four assumptions (Hamilton 1992: 225). The first assumption is that the logit of the dependent variable (Y) is a linear function of the independent variables (Xs), and that all variables are included. Secondly, each case in the analysis must be independent of the other cases (Skog 2004: 380). Such an assumption is almost always fulfilled when using random selection of observations. However, I study the entire "theoretic universe" and can not expect cases to be independent of each other. I address this in the next section. The third assumption concerns multicollinearity. The degree to which an independent variable is a linear function of other independent variables determines multicollinearity. The reason for avoiding multicollinearity is that each independent variable should have a marked individual correlation with the dependent variable. If a model has "too high" multicollinearity estimations may be biased. I can identity the presence of multicollinearity by estimating the *variance Inflation factor* (VIF) defined as:

$$\text{VIF}\ (\beta_{1)} = 1 / (1 - R^2{}_1)$$

$R^2{}_1$ is the variance of variable $X_1$ that is accounted for by the other covariates. By regressing all X variables on each other and finding the $R^2{}_1$ regression I can then assess whether the variance in the estimate is inflated by multicollinearity (Stine 1995: 53). There is no well-defined critical value for what is needed to have "high" VIF values. Some suggest, as a rule of thumb, that values higher than 10 is considered large enough to indicate a problem (Ibid: 53). The nature of my research questions may lead to high VIF values. For example, including a square term is likely to be correlated with its component term in the same model. Lastly, a covariate cannot give close to perfect prediction of the dependent variable (perfect

discrimination). However, this is matter of nuances because discrimination becomes a challenge the better an independent variable is at predicting the dependent variable.

### 5.2.2. Challenges facing econometric studies of civil war

In addition to the mentioned assumption of logistic regression there are several challenges facing the researcher, especially those studying the onset of civil war. Cross-national time-series conflict data (panel data) are exposed to five fundamental problems: *non-independence of observations* (temporal and spatial), *unmeasured unit heterogeneity*, *endogenity* and the *rareness* of civil war onset (Gates 2002). In addition to this we can add *over-fitting* and *missing cases bias*.

Logically, when conducting comparative research, the number of combinations used must not surpass the number of cases analyzed. This causes negative degrees of freedom, so-called over-fitting[21]. This is not a problem in a problem in my analysis, as the number of observations provides sufficient degrees of freedom.

In and of itself missing observations is not necessarily a violation of logistic regression. However, it becomes a problem when the pattern of missing observations is not random. Having systematically missing observations is similar to selection bias. This is a problem plaguing the quantitative civil war studies. A country at war, recently at war or on the verge of war might cause severe problems for data gathering. My data is somewhat subjected to missing data; the data on natural resources reports missing observations for some countries known to have vast amounts of natural resources. An example is Iraq, which is a large producer of petroleum, but data is missing for certain time periods. For pockets of missing values, I could use various imputation techniques. However, I chose not to manipulate the data.

In cross-national time-series data each observation is likely to be dependent on the preceding observation. The likelihood of experiencing civil war is also related to past history. Therefore, the assumption of temporal independence may be invalid, because the risk of a new civil war may be highly influenced by the time passed since the last civil war (Urdal 2005). Similarly, countries that enjoy a history of peace have been found to be less likely to experience civil

[21] Degrees of freedom are the number of cases minus the number of explanatory variables minus one(Fearon 1991: 172)

war (Barbieri & Reuveny 2005: 1240). There are different ways to reduce the problem of temporal dependence. Fearon and Laitin (2003) use a "prior war" dummy variable, measuring whether there was an ongoing civil war in the previous year. However, this variable only takes into account whether there was a war in the preceding year and not whether there was a war two, five or more years ago. Instead, as suggested by Beck, Katz and Tucker (1998), I attempt to control for such temporal dependence between observations with a variable measuring *Time Since Last Onset* of conflict and three cubic splines that approximate the discrete time hazard rates for conflict (Østby 2006: 12) based on the assumption that the risk of a new civil war is largest immediately after a civil war ended and decreases with time passing. Thus, the variable *Time Since Last Onset* is expected to have a negative effect on the likelihood of civil war onset. Obviously, this variable has its limitations because it does not measure the duration of a civil war or take into account when a war ended. Still, I expect it to somewhat reduce the temporal dependence in my analysis. I further cluster my estimates on individual countries so as to not underestimate the standard errors.

There is also a possible relationship with the internal dynamics of a country and its surroundings. States in regions or with neighbors that have ongoing civil wars might be subjected to a spillover effect (e.g. Sambanis 2001; Hegre 2003). I do not control for such a spatial dependence.

The issue of unmeasured unit heterogeneity is a considerable challenge in statistical analyses. The assumption of cross-national studies is that if two countries have the same values on the independent variable the dependent variable should posit the same value as well. However, "*measurement problems and model specification issues in econometric studies of civil conflict guarantee that this assumption is violated*" (Gates 2002: 21). Some countries have certain characteristics that make them less or more exposed to civil war than others. All these characteristics are likely not to be included in the model; there will be omitted variable bias. Heterogeneity is a problem if omitted variables that are fixed for a country, over period, affect the likelihood of civil war onset. I do not use fixed effects to account for such unit heterogeneity. Fixed effects would drop all countries that exhibit no variation on the dependent variable. In the study of civil war onset, this would mean dropping a substantial amount of the total observations because most countries do not experience civil wars.[22]

[22] Collier and Hoeffler(2004: 583-587) lost many observations.

## 5.3. Data and indicators

In this section I account for the variables employed in the statistical models. I begin with explaining the dependent variable and move on to the explanatory variables. Lastly I consider the control variables. Descriptive statistics are presented at the end of this chapter. In this section I also discuss whether the units and variables clarify my research question, in other words the validity and reliability of the data. Validity is determined by "*the correspondence between systemized concepts and operationalized indicators*" (Hellevik 2002: 52). This is crucial, as low validity might create systematic measurement error because something other than exactly what is intended is measured. The data needs to be relevant for the research question. Reliability is a prerequisite for validity (Ibid: 53). It does not matter if I have sorted out valid observations, it they are collected and treated inaccurately. High reliability means "*that applying the same procedure in the same way will always produce the same measure*" (King *et al*. 1994: 25).

### 5.3.1. The Dependent Variable

For the dependent variable measuring conflict onset I rely on the annually updated data created by researchers at the Department of Peace and Conflict Research at the University of Uppsala and the International Peace Research Institute of Oslo (Gleditsch et al. 2010). They define armed conflict as any "*contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths* " (Wallensteen & Sollenberg, 2001: 643). They employ the following definition of a state: "*an internally recognized sovereign government controlling a specified territory, or an internationally unrecognized government controlling a specified territory whose sovereignty is not disputed by another internationally recognized sovereign government previously controlling the same territory*" (Ibid).

I include all internal and internationalized internal conflicts in the dataset. The dataset also divides conflict into three levels: minor, intermediate and war. Minor conflicts means the number of battle-related deaths during the course of the conflict is between 25 and 1.000. The intermediate category refers to conflicts in which more than 1.000 battle-related deaths were

recorded during the course of the conflict, but fewer than 1,000 in any given year. Finally, war includes more than 1,000 battle related deaths in any given year. This thesis uses both the lowest and the highest threshold. Table 7 shows the frequency of conflict onset for the two thresholds.

**Table 7.** *Frequency of Conflict Onset 1970-2007.*

| | **Armed Conflict Onset** | | **Civil War Onset** | |
|---|---|---|---|---|
| | **Frequency** | **Percent** | **Frequency** | **Percent** |
| **0** | 5,595 | 96.63 % | 5,747 | 99.26 % |
| **1** | 195 | 3.37 % | 43 | .74 % |
| **TOTAL** | 5,790 | 100 | 5,790 | 100 |

There are challenges related to including the lowest threshold of battle-related deaths. The data collection was originally done by Wallensteen & Sollenberg, and later extended to include the entire period following WW2 (i.e. 1946 and onwards). Reliability for the original dataset (1989-2000) is considered relatively high. The process of extending the dataset backwards, however, is constructed on more unreliable data. That means the likelihood of underreported armed conflict is considerable because low-intensity armed conflicts are more prone to be underreported than large-scale high-intensity conflicts. Minor conflicts occurring in remote areas or in closed totalitarian regimes might go by unnoticed to outside observers and international media.

A number of conflicts began when there were already one or more other conflicts ongoing in the same state. This is likely to occur in large countries, such as India or the DRC. When studying conflict *onset* specifically, this presents a methodological challenge. The purpose of studying onset and not incident is primarily to measure transitions from peace to conflict. Some scholars have tried to bypass this problem by measuring (1) onset that started in a state of peace and (2) all onsets unconcerned with whether it erupted when another conflict took place in the same country. I have taken this into consideration when conducting the research, but decided to follow prevailing procedure in the literature on conflict onset. The onset of civil conflict is a dichotomous variable taking on the value of 1 in the year a new conflict breaks out, and 0 otherwise. If the conflict intensity falls below the casualty threshold for two

consecutive years, the next observation of the conflict is treated as a new onset. Since the UCDP/PRIO dataset allows for multiple onsets of armed conflict, country-years with ongoing conflict are kept in the dataset.

### 5.3.2. Independent variables

In the proceeding section I clarify the data used to examine the hypotheses.

#### 5.3.2.1. Natural resources

For data on natural resources I use the World Bank (WB) database called *Adjusted Net Savings*. It is a comprehensive attempt at estimating the value of natural resource extraction. It covers 149 countries, both developed and developing, over the period from 1970 to 2007. I extract six measurements (variables) from their data. The first three, which measures natural resource abundance, are *natural resource rent*, *energy resource rent* and *mineral resource rent*, measured in constant 2000 US dollar. This gives us three different measures of resource abundance, one aggregated and two disaggregated[23].

The aggregated measure *natural resource rent* is, according to the World Bank, supposed to be a measure of all natural resources combined (energy, mineral and forest). However, upon close inspection of the data I came across some disturbing facts. Certain countries that were included in the *energy resource rent* dataset were missing in the aggregated dataset. For example, petroleum-rich Qatar is present in the *energy resource rent* data from 1971 to 2007, but is missing for the entire time-series in the *natural resource rent* data. I do not know the reason(s) for such contradictory data points. However, because this can affect my analysis I chose to make my own aggregated measure, simply by taking the individual datasets (energy, mineral and forest) and combine them into one dataset.[24]

*Energy resource rent* covers income oil, natural gas and coal. *Mineral resource rent* include bauxite, copper, iron ore, lead, nickel, phosphate rock, tin, zinc, gold and silver[25]. The value of natural resources is generally calculated as unit rent, that is price *minus* average extraction cost, *times* the amount of resource extracted. Natural gas does not have a single global price so a shadow world price is computed as the average free-on-board price from several points of

[23] To avoid very small coefficients I transformed the variable, so the unit of measurement is 1.000.000.000 USD.
[24] Later in the analysis, I ran the regressions with both measures to examine any difference, but noticed little difference in effect. I therefore chose to use my version of the dataset, which includes more observations.

export. For minerals, the unit rent is computed as the world price of resources minus mining, milling, beneficiation, smelting, and transportation to ports costs, minus a "normal" return to capital (de Soysa & Neumayer 2007).

The last three variables measuring resource dependence are from the same data collection from the WB. However, to measure a country`s dependence on resources *natural resource rent*, *energy rent* and *mineral rent* are measured as percentage of Gross National Income (GNI). This captures the degree to which a state is dependent upon income from the resources in question. The World Bank Development Indicator does contain a more disaggregated measure of natural resource, but only for natural resource dependence. So in order to remain able to compare abundance with dependence I am restricted to a fairly small disaggregation. I lag the variables one year to reduce endogenity.

Because natural resource dependence is measured as share of GNI while the most common measure is GDP, some clarification about the two measures is in order. Gross domestic product (GDP) measures the sum of value added by resident firms, households and government operating in an economy. For example, the value added by a foreign company operating in Germany would count as part of Germany`s GDP. But the earnings of nonresident sources that are sent back to Germany (e.g. earnings of German companies and/or citizens living and working abroad) are not included in Germany's GDP. In recent years, major international institutions such as the World Bank and the International Monetary Fund have used started to use GNI. GNI accounts for these flows in and out of the economy that the GDP measure excludes. For many countries in the developed world these flows in and out of the economy tends to balance out, leaving little difference between GDP and GNI. However, for less developed countries, the difference may be substantial. Their GNI may be noticeably smaller than their GDP due to the presence of foreign companies in important sectors. But developing countries also receive substantial amounts of remittance from citizens living and working abroad, thus also balancing out the difference.

These data have advantages compared to the commonly used primary exports variable (e.g. Collier and Hoeffler 2004). First, it explicitly focuses on a clear and disaggregated set of natural resources (de Soysa and Neumayer 2007). Second, it allows the analysis to move away from the possibly biased measure of exports. The *economic importance* and *value* of natural resources is therefor more clear because it measures these rents directly, rather than indirectly through export data, which is important for the arguments about greed. Third, by not using a

variable, which measures quantities of export (e.g. barrels of oil), I am able to measure the actual value of what is produced, not just the size. The value is important for my analysis, because mechanisms explained in the previous chapter relate not to the quantity of resource, but to how much wealth they generate, either in relation to the economy (dependence) or absolute amount (abundance). Thus by moving away from only aggregated measures, exports and quantity, I attempt to arrive at a suitable measure.

Though the dataset is comprehensive and presents a unified calculation methodology it has certain shortcomings affecting its validity. First, it does not include such lootable natural resources as e.g. diamonds[26]. Second, the dataset only quotes one global price for each year, while we know that the quality of e.g. oil varies from country to country and field to field, which is reflected in the prices. Though these price differences are small the production volumes magnify them. This may create substantial under- or overestimations of production value (Lujala, Rød & Thieme 2007: 241). Another substantial source of error is the estimate for the average production cost. The cost estimate is based on data for a single year for most countries. They assume that unit costs are constant over time. This might cause an estimation error because average production cost in the 2000s might not provide a proper representation of the cost structure in the 1970s, and vice versa (Ibid). For example, if production has shifted from an area close to export ports to a more peripheral area, or from onshore to offshore, the average production costs may rise or fall dramatically. Likewise, if the most readily available fields or sources are developed first and those demanding more special technology later, cost could grow over time. Moreover, first stage development of fields is usually the most costly phase of resource extraction, and when these expenses are not accounted for correctly over the whole production period, or the reported year, it creates a crucial bias in the cost estimates. Wherever the World Bank did not have exact estimate for production cost in a country the unit cost was estimated using figures from nearby countries (Ibid).

Despite these challenges facing the validity of the dataset it presents one of the best sources for cross-country research. The use of value instead of production volume makes comparison easy. It also allows disaggregation of natural resources, meaning that one can evaluate the isolated effect of different resources. The data is readily available online for the public, and has been used in previous research (e.g. de Soysa & Neumayer 2007; Andersen and Aslaksen 2010).

[26] The influence of diamonds on the risk of civil war is disputed. Many case analysts (e.g. Ross 2004) claim there is a substantial link, while large-N studies diverge in their findings. See e.g. Lujala, Gleditsch and Gilmore (2005) for discussion on the role of diamonds in civil war.

### 5.3.2.2. Corruption

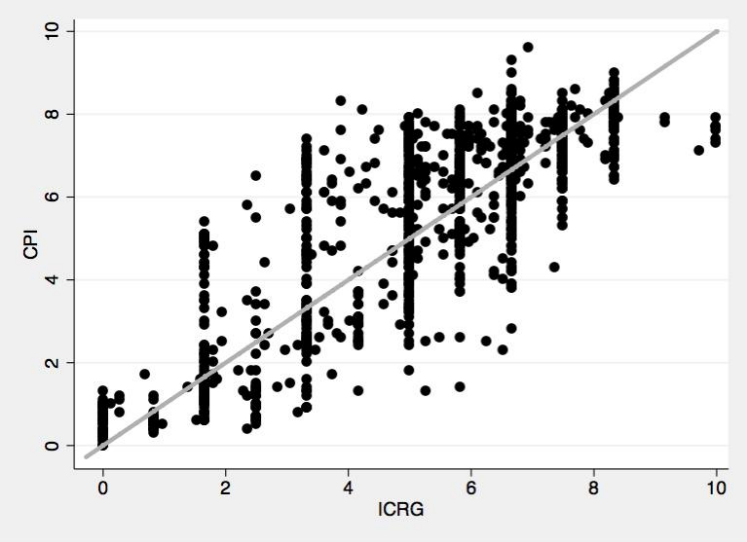
The data source for corruption is The International Country Risk Guide (ICRG) by the PRS Group, Inc. It is a private firm offering an index on perceived corruption in cross-series of 141 countries in the period 1984 to 2008. It has been used by several other scholars. Countries are given values from 0 to 6, where 0 corresponds to most corrupt and 6 to least corrupt. For reasons of interpretation, I reversed the *corruption* variable so 0 corresponds to least corrupt, and 6 to most corrupt. The data takes into account *"actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business*" (ICRG 2012). The observations were lagged one year.

It is difficult, perhaps impossible, to find objective data on corruption, and analysts of corruption encounter a number of problems. The most challenging is perhaps a pervasive lack of data, because those who know of corrupt transactions often have a vested interest in maintaining secrecy (Johnston 1986). The ICRG index relies on evaluations done by country experts. Such evaluations are by definition based on subjectivity, which may be reflected in the values allocated to certain countries. It is not impossible that preconceived levels of e.g. recent economic accomplishment influence the ratings. An analyst might rate a country X. Not knowing too much about the country one might infer that corruption is not too strong because country X has performed well, experienced high economic growth and attracted much investment. Despite possible bias in the data it is close to the theoretical concept. It is not primarily concerned with petty corruption such as paying off a parking ticket. Rather it is concerned with the degree to which redistribution is driven by patron-client interests and if there are widespread practices of private, non-marked accumulation threatening public power (Fjelde & Hegre 2006: 16).

Other cross-national ratings of corruption tend to be highly correlated with each other, across time, and with cross-national polls of citizenries' perception of corruption (Fjelde 2009: 205, Treisman, 2000: 400). Other potential data sources for corruption are the Corruption Perception Index (CPI) and the Business Environmental Risk Intelligence (BERI). BERI was not chosen due to its relatively small panel sample (50 countries). CPI covers more countries, but has a much smaller time-series than ICRG. However, I ran a correlation test between the

ICRG data and CPI[27]. The correlation is high (.83), but not perfect, as shown by Figure 3. They display some variance. If they were perfectly correlated observations would fall along the displayed 45 degree line (grey). The variable is lagged one year in all models.

**Figure 3.** *Scatter plot between the ICRG and CPI corruption index.*




### 5.3.3. Choosing control variables

I base my control variables on prior research, and take the review in chapter 2 as a vantage point for choosing control variables.

### Political Instability

Because my variable measuring political instability has not been used as frequently as many other common indicators of political instability, I will devote some additional space to explain the coding. The variable of interest is the *Adverse Regime Change* from the Political Instability Task Force's (PITF) dataset. PITF is a panel of scholars and methodologists that was originally formed in 1994 after request from senior policymakers in the United States

[27] The ICRG variable is measured on a seven point scale (0-6) and CPI is measured on an eleven point scale(0-10). I therefore transformed the ICRG index to an eleven point scale by multiplying the ICRG index with 10/6 (Tanzi and Davoodi 1997: 10)

Government[28]. The Central Intelligence Agency (CIA) today funds it. Their task, among other things, is to assess and explain the vulnerability of states around the world to political instability and state failure. Researchers at PITF use open-source data to develop statistical models that can accurately assess countries' prospect for major political change and identify key risk factors of interest to US policymakers. Adverse Regime Changes are defined as major, adverse shifts in patterns of governance including:

- *Major and abrupt shifts away from more open, electoral systems to more closed, authoritarian systems.*
- *Revolutionary changes in political elites and the mode of governance.*
- *Contested dissolution of federated states or secession of a substantial area of a state by extrajudicial means.*
- *Complete or near-total collapse of central state authority and the ability to govern.*

Abrupt transitions from more authoritarian rule to more open, institutionalized governance system, defined by PITF as "democratic transitions" are not considered state failures, and thus not included. PITF make use of several evaluation criteria. First they identify regime change as a six or more point drop in the value of a states Polity index score over a period of three years or less (the next section political regime details the Polity Index). About two third of the cases of adverse regime change are identified in this way. In some cases, central regime authority collapses so that no coherent of consistent authority can be identified over a substantial period of time. Polity IV considers such periods as "interregnums" in the coding scheme and they receive the "standardized authority code" of -77 in the dataset. In the PITF code these cases are the second criteria to identify adverse regime changes.

They identified the six-point standard through a thorough analysis of the Polity IV research and data. It indicates a substantial change in the authority characteristics of the regime, meaning it is associated with qualitative changes in the openness of executive politics or general political competitiveness. Still, they consider the threshold of six-point drop as somewhat arbitrary, so additional scrutiny is employed. PITF consider the polity IV data to be accurate and reliable to within two points on the scale. Therefore all borderline cases (i.e.

[28] The composition of the core group of scholars numbers from ten to fifteen and represents several of the US' leading research institutions; current Task Force members come from Arizona State, Columbia, George Mason, Harvard, Maryland, Minnesota, Stanford, and Texas universities.

cases within two points of the threshold number) are reviewed individually for final determination. Borderline cases make up about 15 percent of cases examined.

Lastly, not all cases of adverse regime changes can be identified by changes in POLITY scores in the Polity IV dataset. Around one-third of cases identified as adverse regime changes involve a complete or near-complete collapse of central state authority and institutions and the ability of established political elites to govern effectively. Collapse of central authority are also identified by (1) Revolutionary changes (2) Contested state dissolution (3) Collapse of central authority.

Revolutionary changes may cause the central authority to collapse and be replaced by a new regime comprised of quite different structures, political elites, and/or sources of authority or models of rule. While a profound change, they often adopt authoritarian practices quite similar to those used by the previous regime they replaced. Such revolutionary changes are considered adverse regime changes due to the bounded collapse of central authority that precedes and enables the establishment of the new regime, and not because of a subjective comparison of the relative merits of the prior and post regimes.

Central authority may collapse because of internal pressures to dissolve the state's unity and reconstitute authority in separate territorially redefined administrative units, i.e. new states. If a state's authority resists but is forced into, rather than accepting and designing a territorial reconstitution then it is considered adverse regime change.

Central authority may collapse, in whole or in large part, because of dynamics eroding and undermining institutions and authority structures. In certain cases, there are no alternative elites or authority structures that can or will replace the failed governance system and long periods of chaos or anarchy prevail. In less extreme instances of state collapse, institutions of state authority may continue to exist but their overall capacity and ability to enforce policy is substantially restricted. Because many weak states often do not extend their full control over their entire sovereign jurisdiction, only when a regime is unable to govern at least half of its sovereign obligation (that is, provide essential services and maintain a reasonably effective security and authority presence) measured in terms of population and territory, is it considered adverse regime change. I code all years registered with adverse regime change as 1, and remaining observations take on the value 0. The variable is lagged one year. This dichotomous variable is labeled *Political Instability.* Table 8 presents the observations of *political instability*.

**Table 8.** *Observations – Political Instability.*

| | ***Frequency*** | ***Percent*** |
|---|---|---|
| 0 | 5,717 | 98.74 |
| 1 | 73 | 1.26 |
| Total | 5,790 | 100 |

The variable is chosen because it may provide a relatively high level of validity as it is close to the theoretical definition (*Chapter 3.4*). To measure a state's level of weakness/strength, Fearon and Laitin (2003) employ GDP per capita as an indicator. But as an indicator of state strength or stability it is at best an indirect measure, despite the fact that wealthy states are often strong. The extreme example of North Korea shows how it is not always the case that a poor state is weak or unstable. Further, connecting wealth with strength is in a way counter intuitive to the concept of resource curse, which argue that an increase in income can actually reduce state strength and the governability of a country due to such mechanisms as rent-seeking etc. (Gleditsch and Ruggeri 2007) (Ross 2004). Further complicating the use of GDP per capita as a measure of strength is the fact that other researchers use it as indicator of the level grievance (Collier and Hoeffler 2004). In their reasoning it indicates the opportunity cost of engaging in conflict, and not state strength (see section on development).

Does Civil war necessitate political instability or are conflicts substantially different events from political instability? Goldstone et al. (2010: 192) use data from PITF, and claim this data cover "*analytically distinct events, as they are defined by a substantial change in the institutional structure of political authority, not by a change in level of violence*". In a number of instances civil wars do not involve adverse regime changes. The ruling elite may retain authority through such events, and many adverse regime changes (such as bloodless military coups) occur with none or little violence, and thus do not count as conflict. As discussed in Chapter 3.4 the contingencies that work against the system (e.g. political violence), have no necessary connection with whether the system is stable or unstable (Dowding and Kimber 1983: 239). If one uses the threshold of, say 25, or 1000 battle-related deaths per year then one presumes that all states have the same capacity for dealing with violence. However, different regimes hold different capacities for dealing with violence. For example, consider a system that would become unstable at a certain level of violence, killings or riots per week, say $V$ violence per week. This means the system lacks the capacity to deal with violence at this level or higher. In situations when violence is at a lower level, e.g. $0.3V$, this constitutes a

contingency that does not destabilize the system, and it actually has resources in reserve. In this situation the system is stable despite having the property of being unstable with respect to *V*. As the level violence rises to 0.7*V*, the system continues to cope and remains stable, but with fewer reserves. At 0.9*V* it has even less. Hence, at any level below *V*, "*the state in which the system exists – namely that of being stable with respect to the contingencies that have so far occurred – is the same*" (Dowding and Kimber 1983: 239). What has changed as *V* has changed is not the stability but the violence, one of the contingencies working on the system. The difference between armed conflict onset and political instability can be seen in Table 9. In only 11 instances do the two measures overlap.

**Table 9.** *Cross Tabulation between Political Instability and Armed Conflict Onset, 1970-2007.*

| **Political Instability** | **Civil Armed Conflict Onset** | | **Total** |
|---|---|---|---|
| | 0 | 1 | |
| 0 | 5,533 | 184 | 5,717 |
| 1 | 62 | 11 | 73 |
| **Total** | 5,595 | 195 | 5,790 |

I argue that the data on Adverse Regime Change is a valid proxy for political stability. It is meant to measure whether major structural adverse changes occurred in the pattern of governance. The intention is not measure all aspects of societal stability; hence it is close to the research topics objective. Reliability for this variable is considered high. It is publicly available on PITF's web pages.

## Regime type

I also control for the type of regime in a country by including a measure of democracy. First, several studies have shown a high correlation between natural resources, such as oil, and level of democracy. The studies of Ross (2001a) Wantchekon (2002) and Tsui (2005) all provided evidence that income from oil corresponded with less democracy, claiming that such revenue allowed incumbents to remain in power. Secondly, much empirical evidence point to a reduced risk of civil war among highly democratic regimes (Hegre et al. 2001). The

explanation, as discussed in Chapter 3.4, is that democratic regimes have an incentive to allow protest and accommodate people's demands, while autocracies block any unwanted behavior..

The chosen indicator to measure regime type is the Polity2 variable from the Polity IV index. The Polity IV index is not without problems. A country at war with itself or experiencing political violence can result in a drop on the index (Hegre et al. 2001). Some have also shown that conflict is endogenous in the variable (see Vreeland 2008). The Polity2 variable scores regimes on a 21-point scale, ranging from +10 to -10. The score is found by subtracting the value on an autocracy scale (0-10) from the value on a democracy scale (0-10) (Marshall & Jaggers 2002). Hence, fully institutionalized democratic states score +10 and fully institutionalized autocratic states score -10. Institutionalized autocracies are systems where regularized freedom and regularized political competition are restricted, chief executives are chosen by selection within the political elite, and there are few institutionalized constraints on executive power. Democracy is identified by three elements (1) the presence of institutions and procedures through which citizens can express preferences, (2) the existence of institutionalized constraints on executive power and (3) civil liberties. To also capture the curvilinear effect of democracy, I include a square term of the variable as well. If the linear term is positive and the square term negative, the curvilinear relationship between democracy and civil war should be valid. I lag the variable to reduce chances of reverse causality.

## GDP per capita

GDP per capita is included in model because it is a proxy for development. Data is taken from the World Bank Development Indicators, measured in constant 2000 U.S. dollars. I then divide this by the total population in the country in the corresponding year. The variable is lagged one year.

## Population

Population is a measure of de facto population, counting all residents regardless of legal status or citizenship. It excludes refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. Values are mid-year estimates. The data source is the World Bank, which uses estimates from various sources. This variable is commonly applied in similar research, and I consider it to have a high degree of validity.

## Ethnicity

I add a measurement of ethnic diversity. There are disagreements on the effect of ethnicity on the likelihood of civil war. To Collier and Hoeffler (2004) ethnic and religious diverse organizations make collective action more difficult, thereby decreasing the efficiency of rebellion. An increase in ethnic heterogeneity can initially increase potential conflict, but after a certain point more ethnic groups can make collective action more difficult. According to Horowitz(1985) the relationship between ethnic diversity and civil war is non-monotonic; "*there is less violence in highly homogenous and highly heterogeneous societies*" (Montalvo & Reynal-Querol 2005: 304). It is also likely that there are more conflicts in societies where a large ethnic group faces an ethnic majority. If true, then merely measuring the amount of ethnic groups will not provide an adequate measure to capture the likelihood of conflict. Consequently I employ two measures of ethnicity. I rely primarily on the ethnic and religious fractionalization index from (Ibid):

$$FRAC = 1 - \sum_{i=1}^{N} \pi_i^2$$

Where $\pi_i$ is the proportion of people belonging to religious or ethnic group *i*. The measure is one (entire population) minus the sum of the squared share of every group. The variable ranges from zero to one, from a single dominant group to many small groups. It can be understood as a measurement of the probability that two randomly selected individuals in a country will belong to different ethno linguistic/religious groups.

Ethnic and racial identities are, to some extent fluid. Measuring the concept of ethnicity is difficult. It is a subjective term. Different individuals will come up with different categories and measurements. Thus my measure of ethnic and religious fractionalization and polarization must be viewed with some skepticism. Their validity is low, because they are not able to capture all aspects of ethnic belonging. The Fractionalization index also holds that all ethnic/religious groups wield equal influence/importance, while we know that some groups are more passive than others. The fractionalization index changes little or nothing over time.

## Mountainous Terrain

I include a measure of the percentage of country that it covered by mountainous terrain, from Fearon and Laitin (2003). Their findings indicate that civil wars are more likely to be

undertaken, when a country has rough terrain. This type of terrain favors insurgency because provides hiding and makes it difficult for government forces to combat them. The variable is logtransformed in order to obtain a more normal distribution.

**Table 10.** *Descriptive Statistics.*

| Variable | Mean | Std.Dev | Min | Max | N |
|---|---|---|---|---|---|
| ***Armed Conflict Onset*** | .03 | .18 | 0 | 1 | 5790 |
| ***Civil War Onset*** | .01 | .09 | 0 | 1 | 5790 |
| ***Natural Resource Rent %GNI*** | 3.99 | 10.22 | 0 | 150.70 | 8151 |
| ***Natural Resource Rent*** | .22 | 1.05 | 0 | 21.45 | 7110 |
| ***Energy Resource Rent %GNI*** | 4.10 | 11.31 | 0 | 150.70 | 6381 |
| ***Mineral Resource Rent %GNI*** | .53 | 1.99 | 0 | 34.28 | 6197 |
| ***Energy Resource Rent*** | .24 | 1.12 | 0 | 21.45 | 6219 |
| ***Mineral Resource Rent*** | .01 | .07 | 0 | 2.65 | 6219 |
| ***Mineral Resource Rent(log)*** | .07 | .25 | 0 | 3.30 | 6381 |
| ***Energy Resource Rent(log)*** | .44 | .87 | 0 | 5.45 | 6381 |
| ***Energy Resource Rent % GNI(log)*** | .66 | 1.12 | 0 | 5.02 | 6381 |
| ***Mineral Resource Rent % GNI(log)*** | .20 | .50 | 0 | 3.56 | 6381 |
| ***Corruption*** | 2.95 | 1.37 | 0 | 6 | 3268 |
| ***Political Instability*** | .01 | .09 | 0 | 1 | 8151 |
| ***GDP per capita(log)*** | 7.62 | 1.58 | 4.15 | 11.19 | 6214 |
| ***GDP Growth(log)*** | 1.58 | .81 | -5.10 | 4.68 | 5607 |
| ***Population(log)*** | 15.08 | 2.17 | 9.40 | 21.01 | 7835 |
| ***Ethnic Fractionalization*** | .44 | .29 | .01 | .96 | 5304 |
| ***Religious Fractionalization*** | .29 | .24 | .001 | .78 | 5343 |
| ***Democracy*** | .62 | 7.48 | -10 | 10 | 5563 |
| ***Mountainous Terrain(log)*** | 2.09 | 1.43 | 0 | 4.56 | 5578 |
| ***Time Since Last Onset*** | 12.85 | 10.25 | 0 | 37 | 5790 |

# Chapter 6. Analysis

In this section, I test the hypotheses put forward in the previous chapters, in three sections. I begin with looking at the aggregated measure of natural resource, before I proceed with a more disaggregated measure, namely energy resources and mineral resources. I do this for both resource dependence and resource abundance. This way I will be able to see whether the two measurements yield similar or different results. Lastly, I measure the possible mitigating effect of corruption on the relationship between natural resources and civil war onset. Because this results in quite a few models, I conduct a more thorough interpretation of results that are significant. For comparability, I will illustrate the effect of control variables on a case which is a country with a stable regime and with all other explanatory variables set at mean values, if not otherwise specified. To do so I use CLARIFY (King et al. 2000) to interpret my results and estimate risks at given values of the variables of interest. Based on discussions in Chapter 3 Table 11 presents a summary of the hypotheses to be tested. Hypotheses on the right mirror the ones on the left, and concern resource abundance. The proceeding analyses will follow such a pattern.[29]

**Table 11.** Hypotheses to be tested.

| **Hypotheses** | |
|---|---|
| **H1a:** There is an inverted U-curve relationship between natural resource dependence and civil war onset. | **H1b:** There is an inverted U-curve relationship between natural resource abundance and civil war onset. |
| **H2a:** There is an inverted U-curve relationship between energy resource dependence and civil war onset. | **H2b:** There is an inverted U-curve relationship between energy resource abundance and civil war onset. |
| **H3a:** There is an inverted U-curve relationship between mineral resource dependence and civil war onset. | **H3b:** There is an inverted U-curve relationship between mineral resource abundance and civil war onset. |
| **H4a:** Corruption reduces the adverse effects of natural resource dependence on the likelihood of civil war. | **H4b:** Corruption reduces the adverse effects of natural resource abundance on the likelihood of civil war. |

[29] Regressions were done with Stata 11.

## 6.1 Bivariate Analysis

Before commencing on the multivariate analysis I conduct a bivariate analysis. This is interesting and may provide information because if the bivariate analysis and the multivariate analysis yield different results it could imply spurious effects. Table 12 and 13 presents the result of the bivariate analysis, with armed conflict onset and civil war onset as the dependent variable. It must be noted that these results are not *technically* from a bivariate analysis. *Time Since Last Onset* and three cubic splines are also included in the regression to correct for temporal dependence.

**Table 12**. *Bivariate Analyses of Armed Conflict Onset and Independent Variables*.

| **Resource Dependence** | | **Resource Abundance** | |
|---|---|---|---|
| | *Armed Conflict Onset* | | *Armed Conflict Onset* |
| ***Natural Resource Rent % GNI*** $_{t-1}$ | 0.012<br>(2.07)** | ***Natural Resource Rent*** $_{t-1}$ | 0.013<br>(3.81)*** |
| ***Energy Resource Rent % GNI*** $_{t-1}$ | 0.011<br>(1.75)* | ***Energy Resource Rent*** $_{t-1}$ | 0.013<br>(3.95)*** |
| ***Mineral Resource Rent % GNI*** $_{t-1}$ | -0.006<br>(-0.19) | ***Mineral Resource Rent*** $_{t-1}$ | 0.197<br>(2.91)*** |

*Z* scores in parentheses. Each estimation includes three cubic splines to correct for temporal dependence. Standard errors are clustered by country.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The aggregated measure of natural resource dependence is positively related to the outbreak of armed civil conflict. We see that using natural resource abundance instead of dependence also shows a positive effect on the likelihood of conflict outbreak. Using a more disaggregated measure like energy resources give similar results, but the dependence measure on the left is only borderline significant. The coefficient for mineral resource dependence is negative, but not significant. But replacing the dependence measure with an abundance measure provides the opposite information. Mineral resource abundance is positive and significant at 1 percent level. In table 13 I replaced the dependent variable *armed conflict onset* with *civil war onset*, which uses a higher threshold for battle-related deaths. The results appear robust to a higher threshold.

Looking at the effects of different measures it becomes apparent that energy resources might be what is really driving the results of the aggregated measure. The effect of energy resource

dependence and abundance mirror the aggregated measure. Further, the adverse effect of mineral resource abundance is stronger for civil war than armed conflict.

**Table 13**. Bivariate Analyses of Civil War Onset and Independent Variables.

| **Resource Dependence** | | **Resource Abundance** | |
|---|---|---|---|
| | *Civil War Onset* | | *Civil War Onset* |
| ***Natural Resource Rent % GNI*** $_{t-1}$ | 0.018<br>(1.99)** | ***Natural Resource Rent*** $_{t-1}$ | 0.015<br>(3.00)*** |
| ***Energy Resource Rent % GNI*** $_{t-1}$ | 0.018<br>(1.95)* | ***Energy Resource Rent*** $_{t-1}$ | 0.015<br>(3.34)*** |
| ***Mineral Resource Rent % GNI*** $_{t-1}$ | -0.094<br>(-0.76) | ***Mineral Resource Rent*** $_{t-1}$ | 0.32<br>(3.30)*** |

*Z* scores in parentheses. Each estimation includes three cubic splines to correct for temporal dependence. Standard errors are clustered by country.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

## 6.2 Multivariate analysis.

Having examined at the bivariate analysis I now move on to conduct a multivariate analysis. The bivariate analysis does not take into account the control variables, or higher order terms[30].

### 6.2.1 Aggregated measure of natural resource dependence & abundance

In this section I test the hypotheses that were put forward in the previous chapters, H1, H1b. Initially, it is possible to find support for the notion that *dependence* and *abundance* are two different measures by first observing the correlation between the two variables. The correlation between the two is 0.21, indicating that previous studies, which overlook this divergence might have neglected a substantially interesting difference[31]. If they measured the same underlying phenomena, then the correlation would be close to 1. For example, Sierra Leone 2007 and Zimbabwe 2001 were equally abundant with natural resource rent at around 31 million USD. However, Sierra Leone's economy was much more dependent on these rents than Zimbabwe. In Sierra Leone natural resource rent accounted for 2.4 % of GNI, while it

[30] I did conducted "bivariate" analyses with the square term of the independent variables as well. All square terms were insignificant. See appendix 3.
[31] A correlation matrix of all variables used in the thesis is in appendix 1.

accounted for only .5% of GNI in Zimbabwe. Contrary, natural resource revenue accounted for 2.4% of GNI in both Brazil and Bangladesh in 2004. But the latter had 11 times as much income these resources as the former.

In Model 1.1 I include the first independent variables, natural resource dependence and its square term[32]. A common cause of multicollinearity in regression analyses is the use of predictor variables that are multiplied to create higher order terms (X squared, X cubed etc.). I therefore centered the resource variables at their mean before generating the square term. By doing so I reduced collinearity. According to H1a the square term is expected to have a negative sign, implying a decreasing effect of natural resource dependence at higher levels. The coefficients have the expected signs, but only the linear term is significant. This implies that the effect of natural resources on the likelihood of armed conflict onset is not curvilinear. Hence, I find little support for the proposed curvilinear relationship in H1a.

Next, I replace natural resource *dependence*, with natural resource *abundance*, to examine whether this provides similar or different results than dependence. H1b stated that abundance was an equally good measure of the possible loot for rebels and of state ability to fight off a rebellion as that of dependence. Hence, the inverted U-shaped relationship between conflict onset and natural resource should be present when measuring countries' natural resource abundance. In model 1.2 we see that the estimated effects of natural resource abundance have the expected signs. The variables, however, are not significant at 5 percent level. Only the linear term of natural resource abundance reaches the borderline threshold of <.1 (p=.057). Noteworthy the effect of the linear term is quite strong. The corresponding odds ratio is 1.05. Thus a 1 billion dollar increase in income from natural resources, roughly the size of Ghana 2002, is associated with on average 5% increased risk of armed conflict onset. So far the results only indicate support for a linear relationship between natural resource abundance and the risk of armed conflict onset.

**Table 14.** *Logit model - Natural Resources Dependence, Abundance and Conflict Onset.*

| | **Model 1.1** | **Model 1.2** | **Model 1.3** | **Model 1.4** |
|---|---|---|---|---|
| | *Armed Conflict Onset* | | *Civil War Onset* | |
| ***Natural Resource Rent % GNI(c)*** $_{t-1}$ *(dependence)* | 0.049<br>(2.75)*** | | 0.060<br>(1.51) | |
| ***Natural Resource Rent % GNI(c)***$^2$ $_{t-1}$ *(dependence)* | -0.001<br>(-1.40) | | -0.000<br>(-0.69) | |
| ***Natural Resource Rent(c)*** $_{t-1}$ *(abundance)* | | 0.045<br>(1.73)* | | 0.067<br>(2.18)** |
| ***Natural Resource Rent(c)*** $^2$ $_{t-1}$ *(abundance)* | | -0.001<br>(-1.02) | | -0.000<br>(-1.36) |
| ***Political Instability*** $_{t-1}$ | 1.372<br>(2.38)** | 1.101<br>(1.98)** | 1.784<br>(2.01)** | 1.781<br>(1.97)** |
| ***GDP per capita(log)*** $_{t-1}$ | -0.337<br>(-3.17)*** | -0.327<br>(-3.00)*** | -0.433<br>(-1.62) | -0.522<br>(-2.85)*** |
| ***GDP Growth(log)*** $_{t-1}$ | -0.008<br>(-0.05) | 0.004<br>(0.02) | -0.163<br>(-0.63) | -0.148<br>(-0.55) |
| ***Population(log)*** $_{t-1}$ | 0.194<br>(2.48)** | 0.141<br>(1.74)* | 0.378<br>(2.46)** | 0.25<br>(1.69)* |
| ***Ethnic Fractionalization*** | 0.773<br>(1.98)** | 0.791<br>(1.87)* | 0.004<br>(0.01) | -0.005<br>(-0.01) |
| ***Religious Fractionalization*** | -0.912<br>(-1.65)* | -1.020<br>(-1.89)* | 2.634<br>(2.29)** | 2.184<br>(2.01)** |
| ***Democracy*** $_{t-1}$ | 0.038<br>(1.73)* | 0.023<br>(1.08) | 0.088<br>(2.03)** | 0.077<br>(1.84)* |
| ***Democracy***$^2$ $_{t-1}$ | -0.010<br>(-2.70)*** | -0.012<br>(-3.43)*** | -0.009<br>(-0.91) | -0.018<br>(-2.39)** |
| ***Mountainous Terrain(log)*** | 0.038<br>(0.54) | 0.025<br>(0.37) | 0.138<br>(0.90) | 0.122<br>(0.78) |
| ***Time Since Last Onset*** | 0.208<br>(1.73)* | 0.144<br>(1.31) | -0.206<br>(-1.38) | -0.254<br>(-1.73)* |
| ***Observations*** | 3178 | 3207 | 3178 | 3207 |
| ***Countries*** | 106 | 107 | 106 | 107 |
| $R^2$ | -416.5 | -431.1 | -75.54 | -76.39 |
| ***LL*** | .097 | .087 | .207 | .200 |

*Z* scores in parentheses. Each estimation includes three cubic splines to correct for temporal dependence. Standard errors are clustered by country, and the explanatory variables are lagged for one year. (c) = centered at mean.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Next, in the adjacent models I do the same as in Model 1.1 and 1.2 but replace armed conflict onset with civil war onset, which uses >1000 battle-related deaths as threshold for coding conflict onset. Again, in both models the coefficients have the same signs as in the previous models. Moreover, this time the significance levels are turned upside down; natural resource abundance is positive and significant, while dependence is insignificant. It therefore appears that the level of dependence is a good predictor of small scale fighting, while abundance is a

better predictor of large-scale fighting. Concerning the hypothesized curvilinear relationship, I find no statistically significant evidence to support a declining effect of natural resources on likelihood of civil war onset at higher levels of abundance or dependence.

### 6.2.2 Energy and Mineral resources

I argued that the commonly used aggregated measure of natural resources might cover up the effect of certain resources and that some resources have different effects than others due to lootability. Unfortunately, my disaggregation is limited to rather crude categories, energy and mineral. Still, as the analysis will show, disaggregation has a noticeable effect. Again, the aim is to look at the effects, and possibly different effects of measuring resource dependence and resource abundance. Further, hypothesis H2a, H2b, H3a and H3b proposed a curvilinear relationship between energy and mineral resource dependence and abundance.

Energy and mineral resource dependence, and their respective square terms are added to the equation in Model 2.1. The coefficients again have the expected signs. The square terms of both are negative, implying a decreasing effect of dependence at higher levels of dependence. Looking at their statistical significance, however, only the linear term of energy resource dependence is significant (p=.011). Mineral resources are not significant. The findings weaken H2a, and H3a.

In Model 2.2 the measure of dependence is replaced by the measure of abundance. On the one hand, the estimated effect of mineral abundance is positive and strong relative to energy resources, but not significant. Energy abundance, on the other hand, is borderline significant (p=.068) and positive. Comparing the size of the coefficients in Table 14 and Table 15 suggest that the effect of the aggregated measure of natural resources is largely driven by energy resources, corroborating similar findings in the bivariate analysis. This finding may support the claim of Fearon and Laitin (2003) that among natural resources, fuel and especially oil is *the* major determinant of civil war onset.

**Table 15.** *Logit model – Energy and Mineral Resources Dependence, Abundance and Conflict Onset.*

| | **Model 2.1** | **Model 2.2** | **Model 2.3** | **Model 2.4** |
|---|---|---|---|---|
| | *Armed Conflict Onset* | | *Civil War Onset* | |
| ***Energy Resource Rent % GNI(c)*** $_{t-1}$ *(dependence)* | 0.049<br>(2.55)** | | 0.067<br>(1.87)* | |
| ***Energy Resource Rent % GNI(c)*** $^2$ $_{t-1}$ *(dependence)* | -0.000<br>(-1.25) | | -0.001<br>(-0.88) | |
| ***Mineral Resource Rent % GNI(c)*** $_{t-1}$ *(dependence)* | 0.0939<br>(1.07) | | 0.285<br>(0.92) | |
| ***Mineral Resource Rent % GNI(c)*** $^2$ $_{t-1}$ *(dependence)* | -0.005<br>(-1.05) | | -0.021<br>(-1.05) | |
| ***Energy Resource Rent(c)*** $_{t-1}$ *(abundance)* | | 0.046<br>(1.83)* | | 0.057<br>(1.16) |
| ***Energy Resource Rent(c)*** $^2$ $_{t-1}$ *(abundance)* | | -0.001<br>(-1.17) | | -0.000<br>(-1.07) |
| ***Mineral Resource Rent(c)*** $_{t-1}$ *(abundance)* | | 0.072<br>(0.23) | | 0.538<br>(0.83) |
| ***Mineral Resource Rent(c)*** $^2$ $_{t-1}$ *(abundance)* | | -0.000<br>(-0.02) | | -0.024<br>(-0.64) |
| ***Political Instability*** $_{t-1}$ | 1.372<br>(2.39)** | 1.180<br>(2.08)** | 1.774<br>(1.94)* | 1.899<br>(2.07)** |
| ***GDP per capita(log)*** $_{t-1}$ | -0.374<br>(-3.36)*** | -0.338<br>(-3.01)*** | -0.498<br>(-1.74)* | -0.582<br>(-3.24)*** |
| ***GDP Growth(log)*** $_{t-1}$ | -0.013<br>(-0.08) | 0.012<br>(0.08) | -0.155<br>(-0.56) | -0.123<br>(-0.44) |
| ***Population(log)*** $_{t-1}$ | 0.192<br>(2.34)** | 0.130<br>(1.53) | 0.375<br>(2.27)** | 0.237<br>(1.51) |
| ***Ethnic Fractionalization*** | 0.696<br>(1.77)* | 0.724<br>(1.78)* | -0.117<br>(-0.15) | -0.096<br>(-0.10) |
| ***Religious Fractionalization*** | -0.906<br>(-1.64) | -0.904<br>(-1.69)* | 2.598<br>(2.25)** | 1.893<br>(1.66)* |
| ***Democracy*** $_{t-1}$ | 0.039<br>(1.81)* | 0.029<br>(1.33) | 0.090<br>(2.07)** | 0.067<br>(1.49) |
| ***Democracy*** $^2$ $_{t-1}$ | -0.010<br>(-2.70)*** | -0.012<br>(-3.30)*** | -0.009<br>(-0.92) | -0.018<br>(-2.40)** |
| ***Mountainous Terrain(log)*** | 0.042<br>(0.58) | 0.039<br>(0.56) | 0.136<br>(0.86) | 0.115<br>(0.75) |
| ***Time Since Last Onset*** | 0.200<br>(1.62) | 0.170<br>(1.52) | -0.211<br>(-1.39) | -0.252<br>(-1.72)* |
| ***Observations*** | 3171 | 3171 | 3171 | 3171 |
| ***Countries*** | 105 | 105 | 105 | 106 |
| $R^2$ | -416.2 | -420.6 | -74.99 | -75.62 |
| ***LL*** | .097 | .088 | .213 | .206 |

*Z* scores in parentheses. Each estimation includes three cubic splines to correct for temporal dependence. Standard errors are clustered by country, and the explanatory variables are lagged for one year. (c) = centered at mean.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Model 2.3 and 2.4 uses the highest conflict threshold as the dependent variable. Again, only the linear term of energy dependence is borderline significant (p=0.62) in Model 2.3. In Model 2.4 none of the coefficients are significant. This can be interpreted as favoring a disaggregation of natural resource, because this is contrast to the findings in Table 12, were the linear term of the aggregated abundance measure was actually significant at five percent level.

Based on the results of my analyses and the results of Collier and Hoeffler (2004) I argue that the objections by Fearon (2004) appear valid. First, Collier and Hoeffler (2004) find that civil war risk increases as primary commodity exports increase to around 35 percent of GDP, and declines thereafter. However, very few countries actually reach such high levels of primary commodity dependence (highly skewed data). Hence, the effect is, as I have found, primarily positive, and very inflated even when removing the most extreme values! Second, because of the few observations at high levels of both dependence and abundance, it may make sense methodologically to use the natural logarithm of the explanatory variables. This would also capture the possibility of natural resource increasing conflict risk at a decreasing rate, and is perhaps "*better justified than fitting a upside-down U*" (Ibid: 5)[33]. I therefore estimated the models with the natural log of dependence and abundance instead[34]. The estimated effect at high levels of dependence and abundance are less inflated by the extreme values when the variables were transformed in Table 16. Using the transformed variables did, however, not lead to an appreciably better model fit measured in log likelihood.

[33] It is interesting that de Soysa and Neumayer (2007), using the same data as this thesis, do not discuss the extreme observations and possibility of log transforming the data. See Fearon (2004) for discussions on matters of log transforming natural resource dependence.

[34] I also ran the regression with a square term of the log transformed variables. The results showed no inverted U-shaped relationship between natural resources and conflict onset (results not shown).

**Table 16.** *Logit model – Energy and Mineral Resources Dependence, Abundance and Conflict Onset.*

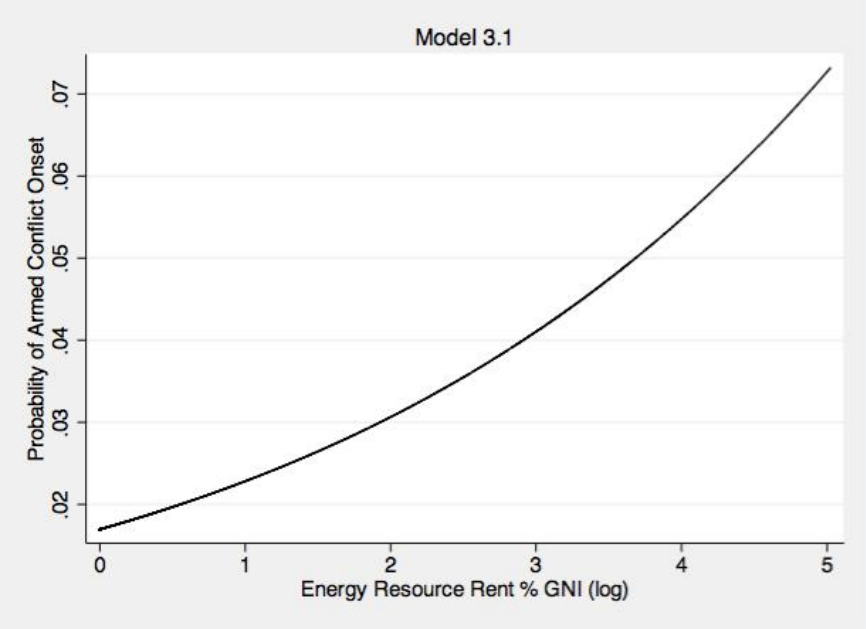
| | **Model 3.1** | **Model 3.2** | **Model 3.3** | **Model 3.4** |
|---|---|---|---|---|
| | *Armed Conflict Onset* | | *Civil War Onset* | |
| ***Energy Resource Rent % GNI(log)*** $_{t-1}$ *(dependence)* | 0.303<br>(3.01)*** | | 0.468<br>(1.79)* | |
| ***Mineral Resource Rent % GNI(log)*** $_{t-1}$ *(dependence)* | 0.079<br>(0.47) | | 0.224<br>(0.43) | |
| ***Energy Resource Rent(log)*** $_{t-1}$ *(abundance)* | | 0.335<br>(2.67)*** | | 0.391<br>(1.22) |
| ***Mineral Resource Rent(log)*** $_{t-1}$ *(abundance)* | | -0.117<br>(-0.21) | | 0.993<br>(0.86) |
| ***Political Instability*** $_{t-1}$ | 1.350<br>(2.33)** | 1.218<br>(2.13)** | 1.819<br>(2.02)** | 1.903<br>(2.07)** |
| ***GDP per capita(log)*** $_{t-1}$ | -0.389<br>(-3.43)*** | -0.392<br>(-3.29)*** | -0.509<br>(-1.67)* | -0.613<br>(-3.12)*** |
| ***GDP Growth(log)*** $_{t-1}$ | -0.008<br>(-0.05) | 0.010<br>(0.06) | -0.160<br>(-0.57) | -0.112<br>(-0.39) |
| ***Population(log)*** $_{t-1}$ | 0.153<br>(1.92)* | 0.094<br>(1.08) | 0.311<br>(1.91)* | 0.200<br>(1.36) |
| ***Ethnic Fractionalization*** | 0.716<br>(1.82)* | 0.689<br>(1.76)* | -0.114<br>(-0.15) | -0.151<br>(-0.17) |
| ***Religious Fractionalization*** | -0.982<br>(-1.84) | -0.948<br>(-1.81)* | 2.408<br>(2.20)** | 1.881<br>(1.72)* |
| ***Democracy*** $_{t-1}$ | 0.038<br>(1.78)* | 0.0333<br>(1.61) | 0.089<br>(2.09)** | 0.074<br>(1.70)* |
| ***Democracy***$^2$ $_{t-1}$ | -0.010<br>(-2.84)*** | -0.012<br>(-3.23)*** | -0.010<br>(-1.22) | -0.017<br>(-2.13)** |
| ***Mountainous Terrain(log)*** | 0.029<br>(0.40) | 0.038<br>(0.54) | 0.105<br>(0.63) | 0.114<br>(0.73) |
| ***Time Since Last Onset*** | 0.186<br>(1.58) | 0.177<br>(1.58) | -0.225<br>(-1.48) | -0.253<br>(-1.76)* |
| ***Observations*** | 3171 | 3171 | 3171 | 3171 |
| ***Countries*** | 105 | 105 | 105 | 105 |
| ***R***$^2$ | 417.4 | -419.5 | -75.47 | -76.05 |
| ***LL*** | .095 | .090 | .208 | .201 |

*Z* scores in parentheses. Each estimation includes three cubic splines to correct for temporal dependence. Standard errors are clustered by country, and the explanatory variables are lagged for one year.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The statistical significance of the explanatory variables remain largely the same when using the natural logarithm, except the linear term of energy dependence went from p< .05 to p< .01, and the abundance measure of mineral resources in Model 1.2 went from positive to negative.

Based on the coefficients in model 3.1 I graphed the results to present a visual interpretation. We see in Figure X that the relationship between energy resource dependence and armed conflict onset is positive; the risk of conflict rises with the level of dependence. The most energy resource dependent countries are the most conflict-prone.[35]`The results appear not be robust to a higher conflict threshold. Only dependence reaches borderline significance (p<.1).

**Figure 4.** *The Effect of Energy Resource Dependence on the Probability of Armed Conflict Onset.*




Y-axis: probability of armed conflict onset. X-axis: Energy resource dependence (log). Results based on Model 3.1. Estimates using postgr3 in Stata 11.

## 6.2.3 Corruption

According to H4 and H4b the effect of natural resources on the likelihood of civil war onset should be reduced as corruption increases. Table 7 shows the number of armed conflict onsets that occurred between 1984 and 2008, divided among different levels on the corruption scale. Remember, corruption is measured on a scale from 0 to 6, where 6 indicate higher levels of corruption. As the table shows, most civil wars occurred among those that had intermediate

[35] Graph for energy resource abundance is in appendix 4

and high levels of corruption. Those between level 3 and 4 experienced 38.6% of all armed conflicts in the period 1984 – 2008. Of course, the information in Table 7 offers only a very preliminary understanding of a possibly complicated interplay between corruption and conflict. However, it paints a trend; conflicts increase with higher levels of corruption, but decreases at very high levels of corruption.

**Table 17.** *Number of Armed Conflict Onset at Different Levels of Corruption (1984-2007).*

| Corruption Level | N | Armed Conflict Onset | %N Armed Conflict Onset |
|---|---|---|---|
| <1 | 210 | 0 | 0 |
| 1 – 2 | 348 | 3 | .01 |
| 2 – 3 | 510 | 9 | .3 |
| 3 – 4 | 997 | 41 | 1.4 |
| 4 – 5 | 762 | 39 | 1.3 |
| > 5 | 245 | 14 | .5 |
| ***Total*** | ***3,072*** | ***106*** | ***3.51*** |

I now move on to examine H4a and H4b by including an interaction term between natural resources and corruption. The preceding analyses showed that the effect on armed conflict and civil war onset was mainly driven by energy rents, while results from mineral rents were not significant. Consequently I proceed with the analysis by only including an interaction term with energy resources, and not the aggregated measure of natural resources or mineral resources[36]. I also use the log transformed variables to reduce inflated results and the influence of extreme observations. However, I keep mineral resources as a control variable in the models. Due to space limits, estimates for the highest battle death threshold are in appendix 1. Estimating the effect of corruption limits my time-series. Data on corruption is only available from 1984 to 2007, and results might be affected by such a reduction of observations.

[36] I ran regressions with an interaction term between the aggregated measure of natural resources and mineral resources and corruption, but without significant results (results not shown).

I begin with looking at the main independent variables, before the interaction term is entered. In Model 4.1 the effect of energy resource dependence is, as expected from findings in Table 16 positive and significant. Interestingly, the coefficient of energy resource dependence in this shorter time-series becomes stronger than in the full time series (.3 to .4). This entails perhaps that the relationship between energy resource dependence and conflict has become stronger in later years.

Next, in Model 4.2 corruption is added to the regression. The corruption variable was centered at mean value due to collinearity. The coefficient of corruption is positive but not significant. It appears that corruption accounts for some of the effect of energy resource dependence and GDP per capita since the size of their coefficients drop slightly when including corruption in the model. But this might be due to sample characteristics, as the models do not have identical sets of observation.

In Model 4.3 the interaction term between energy resource dependence and corruption, as theorized, is negative and significant. This implies that the marginal effect energy resource dependence on the risk of civil war decreases with higher levels of corruption. This finding is very interesting, because dependence and corruption independently are associated with a higher risk of civil war, while their convergent indicates the opposite. Thus the finding lends some support to H4a, and indicates that for energy resource dependent states corrupt performances may rectify some of the distress caused by having an energy resource revenue-dominated economy. Including the interaction term also gives the model a better fit measured by log likelihood.

The preceding three models include the energy resource abundance measure. In Model 4.4 we see that the effect of energy resource abundance is positive, and significant. Next, in Model 4.5 the corruption variable is added. It also shows a positive relationship between corruption and armed conflict onset, implying an increased risk of conflict at higher levels of corruption. The effect is insignificant (p=.3). In Model 4.6 the coefficients of the component terms and their interaction have the expected sign, and are significant at ten percent level. Hence, using the abundance measure presents the same convergent effect between energy resources and corruption.

**Table 18.** *Logit model – Energy rent, Corruption and Armed Conflict Onset (1985-2008)*

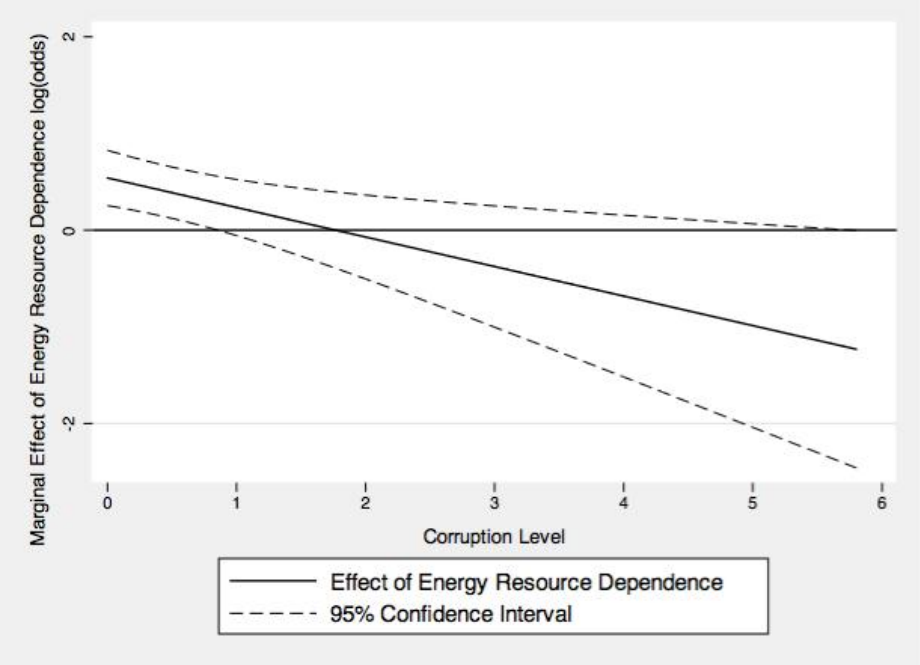
| | **Model 4.1** *Armed Conflict Onset* | **Model 4.2** *Armed Conflict Onset* | **Model 4.3** *Armed Conflict Onset* | **Model 4.4** *Armed Conflict Onset* | **Model 4.5** *Armed Conflict Onset* | **Model 4.6** *Armed Conflict Onset* |
|---|---|---|---|---|---|---|
| ***Energy Resource Rent % GNI(log)*** $_{t-1}$ *(dependence)* | 0.404<br>(3.05)*** | 0.372<br>(2.46)** | 0.540<br>(3.70)*** | | | |
| ***Energy Resource Rent % GNI(log)* Corruption (c)*** $_{t-1}$ | | | -0.305<br>(-2.66)*** | | | |
| ***Energy Resource Rent(log)*** $_{t-1}$ *(abundance)* | | | | 0.506<br>(2.88)*** | 0.386<br>(2.14)** | 0.461<br>(2.39)** |
| ***Energy Resource Rent(log) * Corruption(c)*** $_{t-1}$ | | | | | | -0.152<br>(-2.02)** |
| ***Corruption(c)*** $_{t-1}$ | | 0.080<br>(0.51) | 0.447<br>(1.83)* | | 0.146<br>(0.96) | 0.321<br>(1.67)* |
| ***Mineral Resource Rent % GNI(log)*** $_{t-1}$ | 0.088<br>(0.40) | 0.246<br>(1.03) | 0.307<br>(1.26) | | | |
| ***Mineral Resource Rent(log)*** $_{t-1}$ | | | | -0.281<br>(-0.41) | -0.223<br>(-0.32) | -0.309<br>(-0.42) |
| ***Political Instability*** $_{t-1}$ | 1.158<br>(1.69)* | 1.400<br>(2.08)** | 1.511<br>(2.10)** | 0.957<br>-1.41 | 1.191<br>(1.77)* | 1.25<br>(1.82)* |
| ***Gdp per capita(log)*** $_{t-1}$ | -0.573<br>(-3.24)*** | -0.442<br>(-2.12)** | -0.392<br>(-1.76)* | -0.609<br>(-3.06)*** | -0.466<br>(-1.99)** | -0.468<br>(-1.94)* |
| ***GDP Growth(log)*** $_{t-1}$ | 0.097<br>(0.54) | 0.127<br>(0.58) | 0.125<br>(0.59) | 0.112<br>(0.65) | 0.140<br>(0.67) | 0.158<br>(0.75) |
| ***Population(log)*** $_{t-1}$ | 0.158<br>(1.48) | 0.237<br>(2.10)** | 0.289<br>(2.66)*** | 0.0452<br>(0.34) | 0.11<br>(0.81) | 0.0967<br>(0.72) |
| ***Ethnic Fractionalization*** | 1.264<br>(2.14)** | 1.852<br>(2.80)*** | 1.947<br>(2.93)*** | 1.186<br>(2.01)** | 1.717<br>(2.56)** | 1.672<br>(2.50)** |
| ***Religious Fractionalization*** | -1.621<br>(-2.09)** | -2.21<br>(-2.55)** | -2.066<br>(-2.50)** | -1.549<br>(-2.05)** | -2.117<br>(-2.50)** | -2.08<br>(-2.47)** |
| ***Democracy*** $_{t-1}$ | 0.026<br>(0.84) | 0.026<br>(0.72) | 0.030<br>(0.84) | 0.023<br>(0.80) | 0.021<br>(0.63) | 0.020<br>(0.59) |
| ***Democracy***$^2$ $_{t-1}$ | -0.002<br>(-0.36) | -0.003<br>(-0.41) | -0.003<br>(-0.48) | -0.004<br>(-0.67) | -0.004<br>(-0.68) | -0.005<br>(-0.79) |
| ***Mountainous Terrain(log)*** | 0.054<br>(0.49) | -0.059<br>(-0.45) | -0.065<br>(-0.51) | 0.064<br>(0.59) | 0.010<br>(0.08) | 0.032<br>(0.25) |
| ***Time Since Last Onset*** | 0.312<br>(1.71)* | 0.221<br>(1.22) | 0.219<br>(1.15) | 0.287<br>(1.73)* | 0.189<br>(1.13) | 0.180<br>(1.05) |
| ***Observations*** | 2107 | 1901 | 1901 | 2107 | 1901 | 1901 |
| ***Countries*** | 105 | 95 | 95 | 105 | 95 | 95 |
| $R^2$ | .143 | .146 | .157 | .126 | .140 | .145 |
| ***LL*** | -251.5 | -214.7 | -211.4 | -253.4 | -217.2 | -215.9 |

*Z* scores in parentheses. Each estimation includes three cubic splines to correct for temporal dependence. Standard errors are clustered by country, and the explanatory variables are lagged for one year. (c) = centered at mean.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The coefficient of both component terms is positive and their convergent is negative in Model 4.3 and 4.6, but interpreting interaction effects on the basis of a logistic regression table is not always easy. The coefficient of the convergent term cannot be interpreted as an unconditional marginal effect since it indicates only the effect of a one-unit change in energy resource dependence on the likelihood of conflict onset, when the conditioning variable, corruption, is *zero* (Brambor et al.2006: 73). I therefore graph the marginal effects to asses the extent of the convergent's significance. In Figure 5 we can see how the marginal effect of energy resource dependence is affected by how corrupt a country is, represented by the solid black line. The two-tailed 95% confidence intervals, illustrated by the dotted lines, allow us to determine the conditions under which energy resource dependence have a statistically significant effect on the likelihood of armed conflict onset. When *both* dotted lines are above or below the horizontal reference line (grey) the effect is statistically significant at five percent level.

**Figure 5.** *Marginal effect of Energy Resource Dependence on the Risk of Armed Conflict Onset as Corruption Level Changes.*



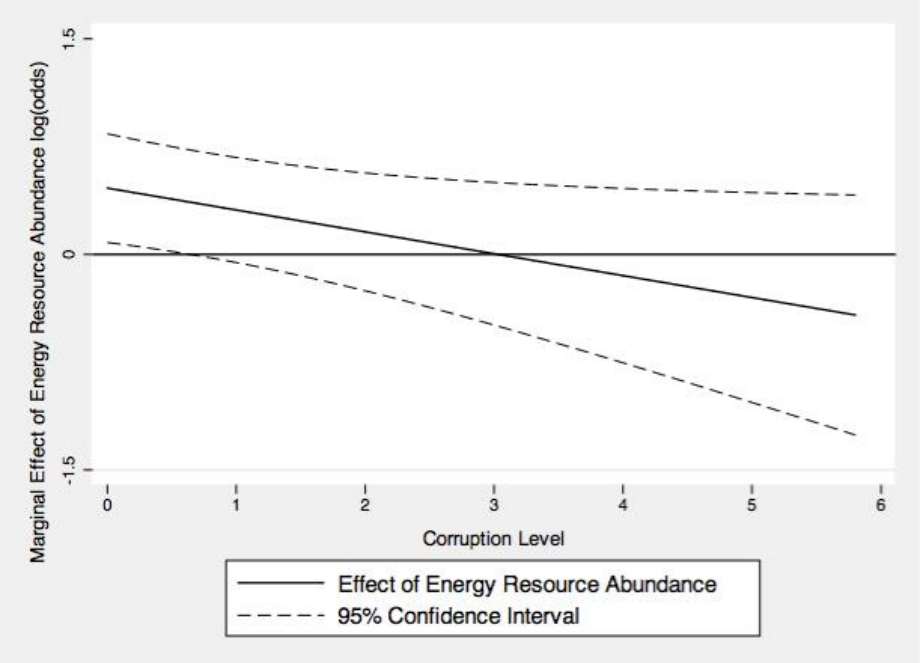

The downward slope shows that energy resource dependence's marginal effect drops as the level of corruption increases. Low levels of corruption reduce the effect of energy resource dependence on the likelihood of civil war. Moreover, it actually offsets the effect of energy resource dependence after exceeding 1.8 on the corruption scale. Thus, higher levels of

corruption actually counteract the harmful effects of energy resource dependence. The dotted 95% confidence lines, however, show that the effect is not statistically significant for all levels of corruption, only for corruption values between 0 - 1. Hence, the effect of energy resource dependence is only significant at very low levels of corruption. At intermediate and high levels of corruption, the effect of energy resource dependence is insignificant.

These findings lend some support to H4. When corruption reaches a certain level the positive relationship between energy resource dependence and conflict onset is not statistically significant. Moreover, the interaction term tells us something about how the effect of corruption is conditioned by energy resource dependence as well (Brambor et al. 2006). One can interpret this as rents used to maintain clientalist networks become destructive when they dwindle (Fjelde 2009).

Figure 6 graphs the conditional marginal effect of energy resource abundance by levels of corruption, based on the coefficients in Model 4.6. Again, the dotted lines show 95% confidence bonds. As in Figure 5, there is a downward slop, meaning energy resource abundance's marginal effect drops as the level of corruption increases.

**Figure 6.** *Marginal effect of Energy Resource Abundance on the Risk of Armed Conflict Onset as Corruption Level Changes.*



By including the interaction term in Model 4.3 and 4.6 the individual coefficients of the component variables do not indicate the average effects of the two, but the effects when the value of the other component term is equal to zero (Brambor et al. 2006). This means that the positive and significant effect of energy resource dependence in Model 4.3 is a prediction within the range of the data used in the regression because the corruption variable is centered at mean value. This is evident by looking at Table 16; there are armed conflict onsets in countries with mean corruption level, e.g. Sri Lanka 1984. The coefficients of corruption also refer to actual points in the data where e.g. energy dependence is zero and conflict onset occurred. Examples are Sri Lanka 1984, Burundi 1991, Nepal 1996 and Eritrea 2003.

As noted by Fjelde (2009) it is important to keep in mind that certain countries contribute considerably to the interaction term between energy resources dependence and abundance, and corruption by being highly corrupt and having a lot of rent from energy resources. These can be found in the energy resource-rich Middle East and, especially Gulf region, and "*...creates the concern that the relationship we are observing is not caused by the interaction between corruption and [oil], but mirrors some region-specific attributes of the Middle East*" (Ibid: 211). Therefore I also included a dummy variable for the MENA region. The results were not noticeably sensitive to such an inclusion[37].

Corruption as a means to co-opt important parts of the populace is not the only reasoning for how countries with natural resources might prevent violent confrontation. The Rentier Theory, Chapter 3 also asserts that rent may increase repression and reduce the threat to the regime (Davenport 1995). Especially when not dependent on the citizenry, but rather on windfall income the ability to repress increases; "*…the cost of repression fall as leaders decreasingly rely on citizens for revenue and the opportunity to repress becomes available*" (Conrad & DeMeritt 2011: 9). For reasons of robustness a measure of repression was therefore included in the models to strengthen the hypothesis that corruption, and not repression, explains the effects[38]. The results were robust to the inclusion of repression.

[37] Results not shown.
[38] Results not shown.

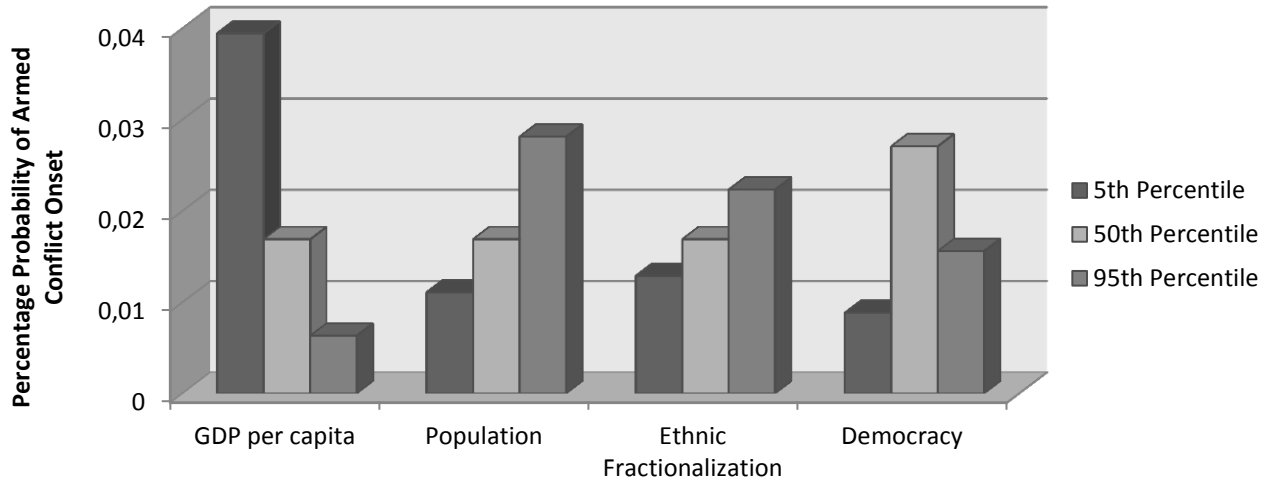
## Assessing the Control Variables

Some control variables are significant while others are not. The onset of political instability remains significant at 5 percent level in nearly all models, corroborating previous findings of an increased risk of civil war following the onset of political instability (Hegre and Sambanis 2006). Further, GDP per capita also has the expected negative sign and is significant in most models. Surprisingly, annual GDP growth is negatively related to conflict onset, and is not significant. A country`s population size appears to be a robust predictor of conflict. Larger populations are more conflict prone than small populations.

The level of democracy and its corresponding square term is significant in most models using the longest time series (1970-2007). We see that the curvilinear effect of democracy is significant in several of the models, using both armed conflict onset, and for civil war as the dependent variable. This finding replicates the conventional finding of an inverted U-shaped relationship between democracy and civil war onset (Hegre et al. 2001), and supports the notion that institutionalized democracies as well as autocracies are in fact less exposed to civil war onset than anocracies. A society`s level of ethnic fractionalization is positively correlated with armed conflict onset and negatively correlated with civil war when analyzing the longest time series.

Ethnic fractionalization therefore appears not to be a very robust predictor of conflict onset. The coefficient for religious fractionalization is negatively correlated with armed conflict and not significant. Contrary, religious fractionalization is negatively correlated with armed conflict onset ($p<.1$) and positively correlated with civil war onset ($p<.05$). The percentage of mountainous terrain is positively correlated with both armed conflict and civil war, but fails to reach any conventional level of significance. The same can be said about time since last onset.

**Figure 7.** *Simulated Probability of Armed Conflict Onset at Different Percentiles, 1971-2007.*




Note: The effects are calculated using CLARIFY in Stata 11, with all other variables set at mean value. The dummy variable political instability is set at value zero. Values are calculated for Model 2.1.

Based on the coefficients in Model 3.1, Figure 4 presents the effect of significant control variables ($p<.1$), holding all other variables at their mean value. Moving from the $5^{th}$ percentile to $95^{th}$ percentile of GDP per capita *decreases* the risk of onset from 4 % to .6%. Contrary, doing the same with population size, the probability *increases* from 1% to almost 3%. Similarly, for cases at the $5^{th}$ and $95^{th}$ percentile of ethnic fractionalization the risk of civil war onset is 1.3% and 2.2% respectively. For cases at the $5^{th}$ percentile of democracy the risk of onset is .9%, and at the $95^{th}$ it is 1.6%, while at the $50^{th}$ percentile the risk is 2.7%. Anocracies appear most exposed to civil war, and autocracies the least exposed.

### 6.2.4 Summary

On the one hand, the analyses have shown that there is no statistically significant evidence of an inverted U-shaped relationship between natural resources and conflict onset, although the inclusion of a square term of natural resources did have the expected negative sign. This is robust to a higher threshold on the dependent variable as well. Using an abundance measure instead of a dependence measure did not change these results. On the other hand, the analysis has given substantial support of a linear relationship between natural resources and conflict onset. Using an abundance measure instead of a dependence measure proved equally able to predict conflict onset, but resulted only in moderately different effects. Turning away from the aggregated measure of dependence and abundance, and instead using energy and mineral

resources confirm that there is no statistically significant effect of a square term of either abundance or dependence. This is robust to a higher threshold on the dependent variable as well. The positive and significant linear effect of natural resource abundance on the likelihood of civil war onset disappeared when disaggregating natural resources. Instead the linear term of energy resource dependence became borderline significant.

Finding only a linear effect of energy resource and mineral resources, I log-transformed the variables. As recommended by Fearon and Laitin, log-transformation might be a better measure as it may capture the decreasing conflict risk at higher levels of natural resources. It also reduced the problem of highly skewed data.

Corruption is positively related with armed conflict onset, but not significant. Including an interaction term between corruption and energy resource abundance and dependence shows that the positive effect of energy resources drop as corruption levels rise. After a certain level (1) of corruption the effect of energy resource dependence and abundance becomes negative and insignificant.

**Table 19.** *Summary of Hypotheses*.

| Hypothesis | Support? | Comment |
|---|---|---|
| **H1a:** There is an inverted U-curve relationship between *natural resource dependence* and civil war onset. | No. | Positive and significant effect for a *linear term*, in both bivariate and multivariate analysis; Robust only for Armed conflict in Multivariate analysis |
| **H1b:** There is an inverted U-curve relationship between *natural resource abundance* and civil war onset. | No. | Positive and significant effect for a *linear term*, in both bivariate and multivariate analysis; More robust for civil war in multivariate analysis. |
| **H2a:** There is an inverted U-curve relationship between *energy resource dependence* and civil war onset. | No. | Positive and significant effect for a *linear term*, in both bivariate and multivariate analysis; more robust for armed conflict in multivariate analysis. |
| **H2b:** There is an inverted U-curve relationship between energy resource abundance and civil war onset. | No. | Positive and significant effect for a *linear term*, in both bivariate and multivariate analysis; more robust to civil war in multivariate analysis. |
| **H3a:** There is an inverted U-curve relationship between *mineral resource dependence* and civil war onset. | No. | No significant result in any of the analyses. |

| | | |
|---|---|---|
| **H3b:** There is an inverted U-curve relationship between *mineral resource abundance* and civil war onset. | No. | Positive and significant effect of a *linear term* for armed conflict and civil war, only in bivariate analysis. |
| **H4a:** Corruption reduces the adverse effects of natural resource dependence on the likelihood of civil war. | Yes. | Low levels of corruption reduce likelihood of corruption. At higher levels of corruption, the adverse effect of energy resource dependence disappears. |
| **H4b:** Corruption reduces the adverse effects of natural resource abundance on the likelihood of civil war. | Yes. | Low levels of corruption reduce likelihood of corruption. At higher levels of corruption, the adverse effect of energy resources abundance disappears. |

## 6.3 Predictive Performance

As discussed in Chapter there are several challenges to quantitative research and logistic regression in particular. One might mistake significance with predictive power, and presenting the statistical significance of an individual variable in a given model does not necessarily imply that the variable in questions is associated with a significant improvement in model's predictive power (Ward, et al. 2010: 367). Ward et al. (2010) suggest doing a predictive power tests. Examining the Receiver Operating Characteristics (ROC) curves does this.

## In-sample Predictive Power

Examining the Receiver Operating Characteristics (ROC) curves is a method commonly used in epidemiological research, but is increasingly being employed in the social sciences. ROC curves plot the rate of true positives (the number of correctly predicted conflict onsets divided by the total number of observations where conflict did occur) against the rate of false positives (the number of incorrectly predicted onsets divided by the total number of cases where conflict did not occur)[39]. This is done for all possible cutoff thresholds between 0 and 1[40]. The area under the curve, known as AUC, then provides an understanding of the model's predictive power as well as a visual inspection. If a model perfectly predicts every outcome the AUC takes the value 1, while a value of 0.5 is equal to chance or simply rolling a dice

[39] Pepe et al. (2009).

[40] This is a relatively robust measure of a model's predictive power, which is not sensitive to the user's choice of threshold such as in classification tables. It also avoids the many 2 x 2 tables that would be needed for all possible thresholds in a classification table.

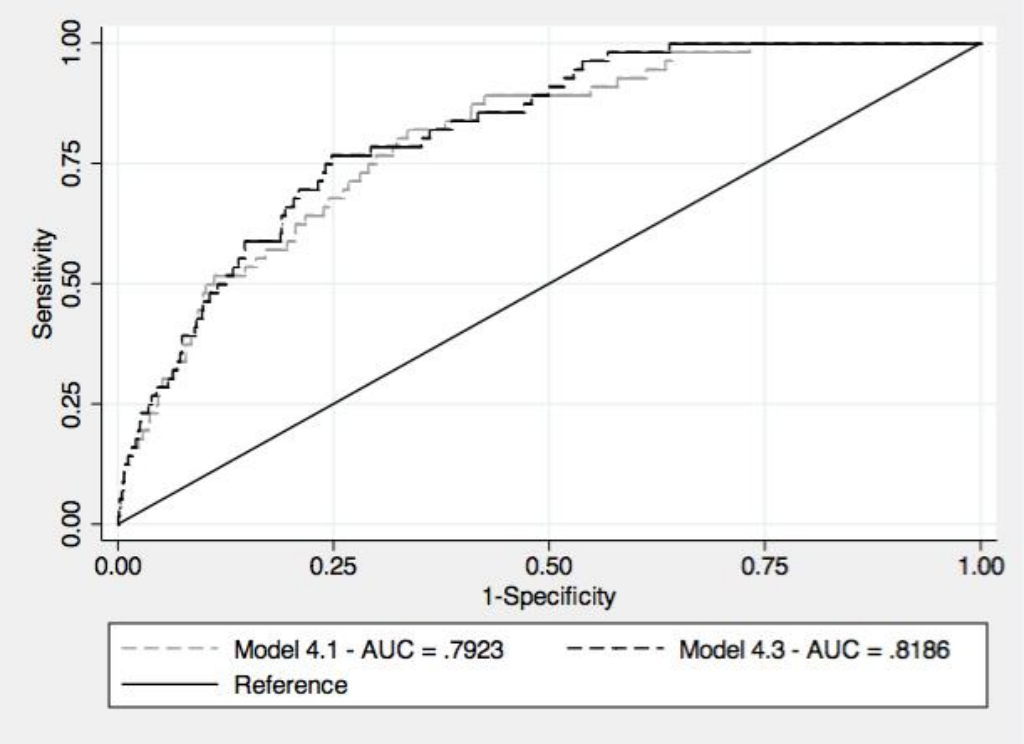
(ibid: 367). I first consider the predictive power of the models, and then move on to examine the predictive power of the individual variables that proved to be significant in the different models.

**Table 20.** *AUC-Values for Model 1.1 - 4.6.*

| **Model** | **1.1** | **1.2** | **1.3** | **1.4** | | |
|---|---|---|---|---|---|---|
| *AUC* | .7368 | .7399 | .8696 | .8761 | | |
| **Model** | **2.1** | **2.2** | **2.3** | **2.4** | | |
| *AUC* | .7501 | .7418 | .8713 | .8762 | | |
| **Model** | **3.1** | **3.2** | **3.3** | **3.4** | | |
| *AUC* | .7450 | .7426 | .8596 | 8655 | | |
| **Model** | **4.1** | **4.2** | **4.3** | **4.4** | **4.5** | **4.6** |
| *AUC* | .7923 | .8095 | 8186 | 7892 | .8010 | .8039 |

In Table 20 we se that all models achieved an AUC-value above 0.5. As an example, consider first Model 1.1 to 1.2. The AUC values have marginal variation. First, the models appear better able to predict civil wars than armed conflict onsets. Further, including the corruption and the interaction between energy resources and corruption also improved the predictive power of the models. We can plot the estimated ROC curve of Model 4.1 and 4.3 to give it a visual inspection (Figure 8). The closer the curve is to the 0.5 reference line, the lower the predictive power is. Conversely, as the curve approaches the upper left corner, the higher the predictive power is. Clearly both are above the 0.5 reference line. Moreover, model 4.3 (black curve) is closer to the upper left corner and thereby has a larger predictive power than model 4.1 (grey curve).

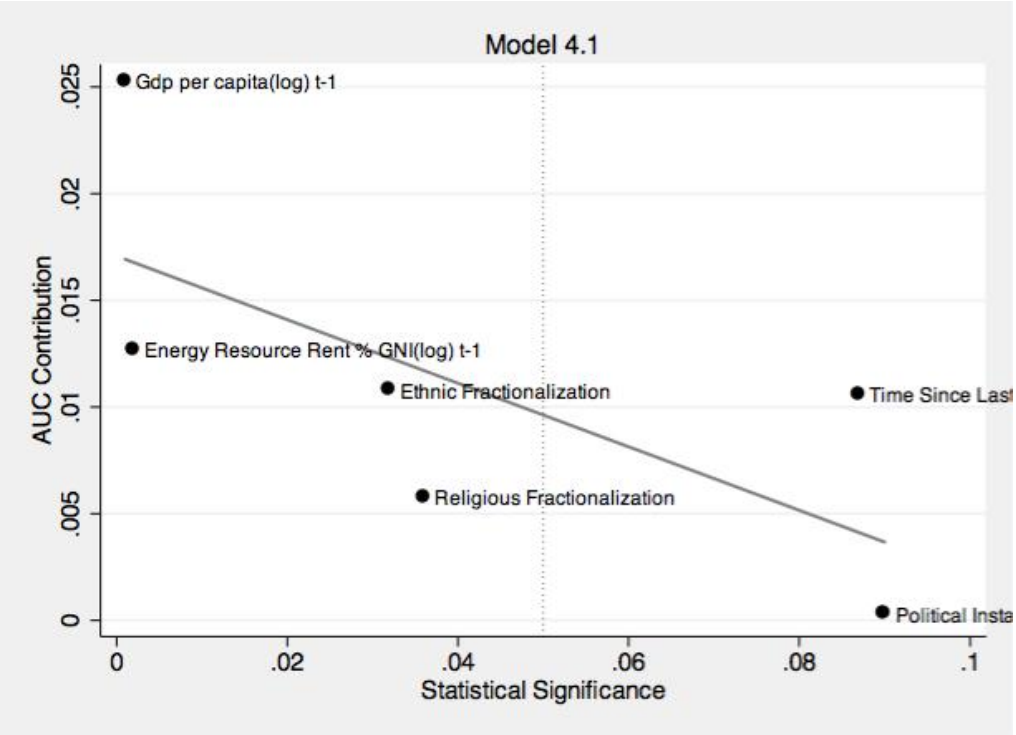
**Figure 8.** *In-Sample Predictive Performance of Model 4.1 and Model 4.3.*




I have assessed the predictive power of each statistically significant independent variable in all models. This is done by deleting the independent variable of interest, and then measuring the effect that the deletion has on the model's ability to make in-sample predictions. The variables' contribution is then assessed by comparing the AUC-values without the variable of interest with that of the original model. Figure 9 uses Model 4.1 as an example[41]. It is a side-by-side comparison of each variable's contribution to Model 4.1's predictive power with its statistical significance. The x-axis shows the variables` statistical significance, while the y-axis represents the marginal contribution each variable makes to original model's predictive power, measured as the difference between the AUC calculated for the full models and the AUC for a model without the particular variable. The grey diagonal line indicates that increased statistical significance *on average* is associated with larger contribution to the model's predictive power.

[41] Remaining plots for all other models are in appendix 8.

**Figure 9.** *Comparison of Statistical Significance and Predictive Power in Model 4.1*




Dotted vertical line indicates 5 percent significance level. The grey slope illustrates the correlation between predictive power and statistical significance.

However, the individual variables' contribution differs significantly. GDP per capita and energy resource dependence contribute substantially more than most other variables. But despite being equally significant in the regression analysis energy resource dependence contributes considerably less than GDP per capita. In this example no variable makes a negative contribution to the model's predictive power (no variable is below zero on the y-axis). On average, GDP per capita appears to be the variable contributing the most to the regression analyses. However, ethnic fractionalization also contributes substantially in several models.

## 6.4 Robustness

### 6.4.1. Multicollinearity

The degree to which an independent variable is a linear function of other independent variables determines multicollinearity. I discussed a possible procedure to identify instances of highly correlated independent variables in Chapter 5, namely the Variance Inflation Factor(VIF). In none of the models employed did the VIF values exceed the threshold of 10. However, some VIF values did reach levels above 5. This is almost always a challenge when including the quadratic term of another independent variable in the model. The highest reported individual VIF value was 5.19. In the case of Model 4.2, 4.3, 4.5 and 3.6 VIF values were originally high, but centering the corruption variable reduced this. Below is a table of *average* VIF values for all covariates all models[42]. One may notice that the VIF values rise in the models that include quadratic terms of natural resources.

**Table 21.** *Average VIF values for all models.*

| **Model** | **1.1** | **1.2** | **1.3** | **1.4** | | |
|---|---|---|---|---|---|---|
| *Avg. VIF* | 1.82 | 2.03 | 1.82 | 2.05 | | |
| **Model** | **2.1** | **2.2** | **2.3** | **2.4** | | |
| *Avg. VIF* | 2.25 | 2.36 | 2.26 | 2.37 | | |
| **Model** | **3.1** | **3.2** | **3.3** | **3.4** | | |
| | 1.47 | 1.56 | 1.46 | 1.57 | | |
| **Model** | **4.1** | **4.2** | **4.3** | **4.4** | **4.5** | **4.6** |
| *Avg. VIF* | 1.47 | 1.64 | 1.70 | 1.56 | 1.75 | 1.80 |

### 6.4.2. Outliers, influential cases

It may often be the case in logistic regression with observational data that there is a presence of highly influential data points, and "*detection of outliers and influential cases and corresponding treatment is a very crucial task of any modeling exercise*" (Sarkar, Midi and Rana 2011:26). Outliers are observations whose values deviate from the expected range and generate large residual. This may indicate a sample peculiarity, and should not influence our results because it may lead to incorrect inferences. Influential observations are those whose removal leads to substantial change in the estimate of coefficients. I identify outliers by calculating the delta deviance ($\Delta X^2_D$) statistic, which is the sum of squared deviance residuals.

[42] Detailed VIF values for each covariate are in Appendix 5

As a rule of thumb, values above 4 indicate a substantial outlier (Hamilton 1992:237). Further, to investigate the presence of highly influential observations I compute the dbeta statistic for all the regressions, which measures the influence on all the model`s coefficients. Dbeta is analogous to Cook`s D in OLS, and observations are deemed influential if dbeta statistic > 1(Ibid: 236)(Cook 1977). As recommended by Hosmer and Lemeshow (1989) (quoted in Hamilton 1992: 538) I graph diagnostic plots for all models based on the two statistic against the predicted values[43].

Influential cases (dbeta>1) appears not to be a major threat to the models` robustness. For example, in Model 1.1 to 2.4 only 1 observation had values above 1, Saudi Arabia 1979. However, closer inspection reveals that four more observations stand out from the remaining observations. This is illustrated in Appendix 6. I therefore ran the all the regression without these observations. The results showed no noticeable effect after omitting these.

Upon examining the cases` $\Delta X^2_D$ I found rather alarming results; many observations have values above 4. Actually, most of the cases with high delta deviance are cases with conflict onset. And most cases with conflict onset have values above 4[44]. There are probably two reasons behind this. First, most variables in the models are relatively constant over time and do not vary much. One exception is energy resource dependence. This variable shows considerable changes before and after the outbreak of conflict. For instance, Angola's dependence on energy resources was 41% of GNI in 1997, the year before fighting between the government and separatist in Cabinda broke out, and dropped to around 27% of GNI the following year. This case (armed conflict onset) is well predicted by the models, and is not an outlier. Second, armed conflict and civil war onset are, as discussed previously, very rare events. Not surprisingly, the models appear weak at predicting onsets. The three most extreme outliers (United States 2001, United Kingdom 7712 and Paraguay 5792) are all conflict observations in states with no past conflict, stable democratic or autocratic regime, relatively wealthy and have stable resource production. When dropping the three cases with the highest $\Delta X^2_D$, the coefficients remain largely unchanged.

[43] All graphs are available in the appendix 6.
[44] See Appendix 7.

# Chapter 7. Concluding Remarks

The greed approach to the "resource-conflict" link has gained a lot of attention. The debate has largely been dominated by the belief of a negative impact of natural resources on internal peace. This thesis attempted to ask a quite grand question: *Do natural resources increase the risk of civil war*? I have tried to argue for more nuances in the debate concerning natural resources and greed, and supplemented the debate about adverse outcomes from natural resources by reviewing the economic and political outcomes from the windfall income of natural resources. The contribution of this thesis to the study of natural resources and conflict is primarily 3-fold.

First, there are contradictory predictions between the greed motivated rebellion framework of Collier and Hoeffler (2004) and the Rentier Theory. The former posits that greed actually reduces rebellion, through corruption. Herein lies the possible contradiction; can individual greed caused by targeted distribution of rent, reduce the likelihood of group greed turning into rebellion? With income from natural resources the Rentier Theory claims patronage can dampen pressure from the opposition. Using the endowments from nature the incumbent can thus prevent the formations of independent social groups, because individual access into positions of bribe-collection should halt the formation of group action.

Second, I have argued for why the commonly used primary export as share of GDP might contain several measurement challenges. This is not solely a methodological matter, but also a theoretical matter. Export figures can be an indirect measure of a country's economic size and level of development. In general, highly developed countries export less of their natural resources than less developed countries. If greed and desire for loot is the motivation for rebellion, then the actual income from natural resources should be better able to capture the loot. Thus, to avoid the bias of measuring export I instead focused on the actual size and value of natural resources extracted, whether exported or sold domestically. Because natural resources are quite heterogenic in terms of lootability, I also argued that natural resources should be disaggregated.

Third, there is a persistent lack of debate concerning the important of distinction between resource *abundance* and resource *dependence*. The existing literature in this field of study has so far almost exclusively focused on dependence, and sometimes treated the two concepts as identical. Dependence is the degree to which an economy relies on the resource in question. Further, abundance tells us something about the wealth from natural resources. This

distinction is important for assessing whether greed motivated rebellion explains the resource-conflict link. If Collier and Hoeffler's (2004) greed is the motivation, then it could also be the abundance of resources which matter when would-be rebels make a cost-benefit of whether or not they should launch a rebellion. The debate around the resource-conflict should thoroughly discuss this difference, and my contribution here is only a modest contribution to such a debate. Assessing greed and the differing nature of abundance and dependence is also important when evaluating the mitigating effect of corruption on the adverse effects of natural resources. Using wide-scale corruption requires access to large funds. Thus a country's *dependence* on natural resources is unlikely to capture a state's ability to buy off an opposition due to vast amounts of natural resource rents. Rather, it is abundance which

## 7.1 Findings and implications

Before commenting on results and their implications, some lessons learned are in order. Quantitative research in the social sciences often lack good data, and the data used to test the hypotheses in this thesis is no exception. I purposely chose less disaggregated data with shorter-than-desired time series to ensure that a similar data collecting methodology was used for all types of resources when measuring *both* dependence and abundance. I believe this is more "scientific" than the alternative. The alternative would be to replicate datasets from various earlier researchers. But these datasets use very different sources and measure different types of resources. By not replicating previous studies I also had to argue for why certain variables were included in model. I therefore devoted some space to review, in part, what are commonly believed to be relevant determinants of civil war. These were then subsequently used in the regression analyses. I chose to use logistic regression analysis of panel data. One may argue that this quantitative approach to the puzzle of natural resources and conflict could have been examined by in-depth case studies. But it would be insufficient for answering the research propositions in this thesis because part of the puzzle entailed the measurement of natural resources employed in much previous quantitative research on the subject.

I also believe that logistic regression was beneficial because it allowed for control of various variables, such as regime type, development, population and ethnicity. Further, the quantitative approach made it possible to test hypotheses concerning conditional effects (corruption). Thus, I believe there is still more information to acquire from panel data analysis on the natural resource-conflict nexus.

The curvilinear relationship, using primary commodity exports, found by Collier and Hoeffler has been accepted by many. I have attempted to address this using a different dataset on natural resources than Collier and Hoeffler (2004), and by examining both the level of dependence and abundance. This analysis has shown support for an adverse effect of both natural dependence *and* natural resource abundance on conflict. Further, the results seem robust to the stricter definition of conflict (>1000 battle-related deaths). Based on a review of literature on the resource-conflict link, Ross (2004: 349) asserted that "*we do not know if non-fuel minerals pose the same problems as oil and gas*". My findings indicate that they do not have the same adverse association with conflict as fuel resources do; the effect of energy resources was significant, while the effect of mineral resource abundance was only significant in a bivariate regression. When controlling for such important variables as GDP per capita, population mineral resource abundance has no significant effect on the likelihood conflict onset.

However, the results lend little support for the hypothesized curvilinear relationship between natural resources and conflict claimed by Collier and Hoeffler (2004). The results of a square term of natural resources proved insignificant for both energy resource and mineral resources. The negative findings of a curvilinear relationship in this thesis have two plausible interpretations. First, as mentioned above, insufficient data and empirical measures that might not be adequate to testing natural resources, conflict and various social, economic and political factors may have affected the findings. Alternatively, it may disprove the greed model, and instead strengthen other arguments, such as the weak state argument (Fearon and Laitin 2003). Perhaps the non-finding of a curvilinear relationship is due to the nature of e.g. energy resources, especially oil. According to Le Billon's (2001) typology of different natural resources oil, which is an important energy resource, is not likely to induce rebellion or warlordism. Instead oil is likely to remain in government control. Such a resource is mostly beneficial to rebels if they opt for secession or a coup d'état. Hence, I believe it essential to disaggregate natural resource types *and* conflicts further to asses the individual resources' association with different types of conflict. Natural resources are heterogenic in terms of lootability for geographical, economic, physical, and political reasons. Moreover, because aggregated (country level) data treat the reach of conflicts as the same, I believe further research should also employ newer tools, such as georeference data. The use of such data has already been employed in other disciplines of conflict studies (see. e.g. Buhaug and Rød 2006), but remains limited in time and space.

The arguments of the greed approach and the curvilinear effect natural resources have influenced many, in academia and policy. Why is this so? Perhaps it is due to the simplistic interpretation of the world it provides. In order to scoop out our apprehension and in doing so hopefully augment our capacity to implement functional policies, more robust theories appear necessary

The analyses in this thesis have also made an effort to clarify how corruption might condition the exposure to conflict outbreak in countries with natural resources. The outcome lends some support in direction of strategic use of energy rent to selectively accommodate individual greed to mitigate the risk of violent challenge to the government authority. Finding a significant and negative interaction effect between corruption and energy resources is, however not robust to a stricter battle-related deaths threshold. At higher levels of corruption the adverse effect of energy resource dependence disappears. Hence, we can not say that there is such a thing as "rentier peace", and the findings do not endorse corruption as tool for peace. Instead we may infer that disentangling the governance indicators should be the primary task of future research in this field. It would not make sense to say that more corruption in Canada and Norway imply lower risk of conflict. The results are averages; indicating the need to further unwind governance indicators when studying the resource-conflict link. As noted by Fjelde (2009: 214) political corruption might function as an adequate option for the advancement of support where state institutions are weak. More theory from in-depth case studies are thus very welcome.

# Bibliography

Aas, Siri Camilla Rustad, Jan Ketil Rød, Wenche Larsen and Nils Petter Gleditsch (2008). "Foilage or Fighting: Forest resources and the onset, duration and location of civil war", *Political Geography*, Vol. 27, no. 7, pp. 761-782.

Acemoglu, D., Robinson, J. A., and Verdier, T. (2004). "Kleptocracy and divide and rule: a theory of personal rule", *Journal of the European Economic Association* Vol. 2, pp. 162-192.

Addison, Tony, Philippe Le Billon and S. Mansoob Murshed (2003). "Conflict in Africa: the cost of peaceful behavior?", *Journal of African Economics*, Vol. 11, No. 3, pp. 365-386.

Ake, Claude (1967). "Political Integration and Political Stability: A Hypothesis", *World Politics*, Vol. 19, No. 3, pp. 468-499.

Andersen, Jørgen J. and Silje Aslaksen (2010). "Oil and Political Survival", Oslo: ESOP – Centre for the study of equality, social organization and performance.

Anyanwu, John C. (2002). "Economic and Political Causes of Civil Wars in Africa: Some Econometric Results", *Economic Research Papers*, No. 73.African Development Bank.

Auty, Richard M. (2001). "The Political Economy of Resource-Driven Growth*"*, *European Economic Review*, Vol. 45. No. 4-6, pp. 839-846.

Basedau, Matthias and Jann Lay (2009). "Resource Curse or Rentier Peace? The Ambiguous Effects of Oil Wealth and Oil Dependence on Violent Conflict", *Journal of peace Research*, Vol. 46, No. 6, pp. 757-776.

Barbieri, Katherine and Rafaen Reuveny (2005). "Economic Globalization and Civil War", *The Journal of Politics*, Vol 67, No. 4, pp. 1228-1247.

Beblawi, Hazem (1990). "The Rentier State in the Arab World", In Giacomo Luciani (ed), *The Arab State.* London: Routledge.

Beck, Nathaniel, Jonathan N. Katz and Richard Tucker (1998). "Taking Time Seriously: TimeSeries-Cross-Section Analysis with a Binary Dependent Variable", *American Journal of Political Science*, Vol. 42, No.4, pp. 1260–1288.

Blimes, Randall J. (2006). "The Indirect Effect of Ethnic Heterogenity on the Likelihood of Civil War Onset", *Journal of Conflict Resolution*, Vol. 50, No. 4, pp. 536-547.

Buhaug, Halvard and Jan Ketil Rød (2006). "Local Determinants of African Civil Wars, 1970-2001", *Political Geography*, Vol. 25, No. 3, pp. 315-335.

Buhaug, Halvard, Scott Gates and Päivi Lujala (2009). "Geography, Rebel Capability, and the Duration of Civil Conflict", *Journal of Conflict Resolution*, Vol. 53, No. 4, pp. 544-569.

Brückner, Markus and Antonio Ciccone (2007). "Growth, Democracy, and Civil War". CEPR Discussion Paper No. DP6568.

*CIA* https://www.cia.gov/ [accessed Oct. 2012]

Cleveland, William L. (2004*). A History of the Modern Middle East.* USA: Westview Press.

Collier, Paul and Anke Hoeffler (1998). "On Economic causes of Civil War", *Oxford Economic Papers*, Vol. 50, No. 4, pp. 563-573.

Collier, Paul (2000). "Rebellion as a Quasi-Criminal Activity", *Journal of Conflict Resolution*, Vol. 44, No. 6, pp. 839-853.

Collier, Paul and Anke Hoeffler (2000). "Greed and Grievance in Civil War", *World Bank Policy Research Paper*, 2355.

Collier, Paul and Anke Hoeffler (2002). "On the Incidence of Civil War in Africa", *Journal of Conflict Resolution*, Vol. 46, No. 1, pp. 13-28.

Collier, Paul, V. L. Elliott, Håvard Hegre, Anke Hoeffler, Marta Reynal-Querol and Nicholas Sambanis (2003). "Breaking the Conflict Trap: Civil War and Development Policy". *A World Bank Policy Research Report*.

Collier, Paul and Anke Hoeffler (2004). "Greed and Grievance in Civil War", *Oxford Economic Papers*, Vol. 56, No. 4, pp. 563-595.

Conrad, Courtenay R. and Jacqueline H.R. DeMeritt (2011). "Human Rights Advocacy and State Repression Substitutability." Paper prepared for the Annual Meeting of the American Political Science Association, Seattle, Washington.

Cook, Dennis (1977). "Detection of Influential Observations in Linear Regression". *Technometrics*, Vol. 19, No. 1, pp. 15-18.

Cuaresma, Jesus C., Harald Oberhofer and Paul A. Raschky (2010). "Oil and the duration of dictatorships", *Public Choice*, Vol. 148, No. 3-4, pp. 505-530.

Davenport, Christian (1995). "Multi-dimensional threat perception and state repression: An inquiry into why states apply negative sanctions", *American Journal of Political Science,* Vol. 39, No. 3, pp. 683-713.

Dixon, Jeffrey (2009). "What Causes Civil Wars? Integrating Quantitative Research Findings", *International Studies Review*, Vol. 11, No. 4, pp. 707-753.

Dowding, Keith M. and Richard Kimber (1983). "The Meaning and Use of 'Political Stability", *European Journal of Political Research*, Vol. 11, No. 3, pp. 229-243.

The Economist http://www.economist.com/node/1795921[accessed Dec. 2011]

Ellingsen, Tanja (2000). "Colorful Community or Ethnic Witches' Brew?: Multiethnicity and Domestic Conflict during and after the Cold War", *Journal of Conflict Resolution*, Vol. 44, No. 2, pp. 228-249.

Fearon, James D and David Laitin (2003). "Ethnicity, Insurgency, and Civil War", *American Political Science Review*, Vol. 97, No. 1, pp. 75-90.

Fearon, James (2005). "Primary Commodity Exports and Civil War", *Journal of Conflict Resolution*, Vol. 49, pp. 483-507.

Fjelde, Hanne and Håvard Hegre (2006). "Democracy Depraved. Corruption and Institutional Change 1985-2000." Paper prepared for the 'Polarization and Conflict' general meeting, Cordoba, Spain, November 23-25, 2006.

Fjelde, Hanne (2009). "Buying Peace? Oil Wealth, Corruption and Civil War, 1985-99", *Journal of Peace Research*, Vol. 46, No. 2, pp. 199-218.

Friedman, Thomas (2005). "The Geo-Green Alternative", *The New York Times*, Jan. 2005. http://www.nytimes.com/2005/01/30/opinion/30friedman.html?_r=1 [accessed Dec. 2011]

Gates, Scott (2002). "Empirically Assessing the Causes of Civil War." Paper presented at the the International Studies Association, New Orleans, 24-27 March.

Geddes, Barbra (1990). "How the Cases You Choose Affect the Answers You Get: Selection Bias in Comparative Politics", *Political Analysis*, Vol. 2, No. 1, 131-150.

Gelb, Alan (1988). *Oil Windfalls: Blessing or curse?*. Oxford: Oxford University Press.

George, A. L., and A. Bennett (2005). *Case studies and theory development in the social sciences*. Cambridge, MA: MIT Press.

Gleditsch, Nils Petter, Peter Wallensteen, Mikael Eriksson, Margareta Sollenberg and Håvard Strand (2002). "Armed Conflict 1946 2001: A New Dataset", *Journal of Peace Research*, Vol. 39, No. 5, pp. 615-637.

Gleditsch, Kristian Skrede, Andrea Ruggeri (2007). "Political opportunity structures, democracy, and civil war." Paper prepared for presentation at the 6th SGIR Pan European International Relations Conference, Turin 12-15 September 2007.

Gleditsch, Kristian Skrede, Andrea Ruggeri (2010). "Political opportunity structures, democracy, and civil war", *Journal of Peace Research*, Vol. 47, No. 3, pp. 299-310.

Grossman, Herschel I. (1991). "A general Equilibrium Model of Insurrections", *The American Economic Review*, Vol. 81, No. 4, pp. 912-921.

Grossman, Herschel I. (1999). "Kleptocracy and Revolutions", *Oxford Economic Papers*, Vol. 51, No. 2, pp. 267-283.

Gurr, Ted R. (1993). "Why Minorities Rebel: A Global Analysis of Communal Mobilization and Conflict Since 1945", *International Political Science Review*, Vol. 14, No. 2, pp. 161-201.

Gurr, Ted R. and Harff, Barbara (1994). *Ethnic Conflict in World Politics*. Boulder: Westview Press.

Gylfason, Thorvaldur (2001). "Nature, Power, and Growth." CESifo Working Paper No. 413

Haber, Stephen and Victor C. Menaldo (2011). "Do Natural Resources Fuel Authoritarianism? A Reappraisal of the Resource Curse", *American Political Science Review*, Vol. 105, No. 1, pp. 1-26.

Hamilton, C. Lawrence (1992). *Regression with Graphics: A Second Course in Applied Statistics.* Belmont, California: Duxbury Press.

Hegre, Håvard, Ranveig Gissinger and Nils Petter Gleditsch (2003). "Globalization and Internal Conflict". World Bank.

Hegre, Håvard and Nicholas Sambanis (2006). "Sensitivity Analysis of Empirical Result of Civil War Onset", *Journal of Conflict Resolution*, Vol. 50, No. 4, pp. 508-535.

Hellevik, Ottar (2002). *Forskningsmetode i Sosiologi og Statsvitenskap*. Norway: Universitetsforlaget.

Hendrix, Cullen S. (2011). "Head for the Hills? Rough Terrain, State Capacity, and Civil War Onset", *Civil Wars*, Vol. 13, No. 4, pp. 345-370.

Hind, Dan (2011). "Libya: Like Norway, but warmer", *Aljazeera English Online*, Sep. 2011.

http://www.aljazeera.com/indepth/opinion/2011/09/20119614201258536.html [accessed Mar. 2012]

Hirschleifer, Jack (2001). *The Dark Side of the Force: Economic Foundations of Conflict Theory*. Cambridge: Cambridge University Press.

Homer-Dixon, Thomas (1999). *Environment, Scarcity and Violence*. USA: Princeton University Press.

Horowitz, Donald L. (1985). *Ethnic Groups in Conflict*. USA: University of California Press.

Humphreys, Macartan (2005). "Natural Resources, Conflict, and Conflict Resolution", *Journal of Conflict Resolution*, Vol. 49, No. 4, pp. 508-537.

Huntington, Samuel P. (1996). *The Clash of Civilizations and the Remaking of World Order*. New York: Simon & Schuster.

ICRG (2012) http://www.prsgroup.com/ICRG_Methodology.aspx#PolRiskRating [accessed Oct. 2012]

IDMC (2011). http://www.internal-displacement.org./publications/global-overview-2011 [accessed Apr. 2012]

Johnston, Michael (1986). "Right & Wrong in American Politics: Popular Conceptions of Corruption", *Polity*, Vol. 18, No. 3, pp. 367-391.

Kalyvas, Stathis N. (2003). "The Ontology of "Political Violence": Action and Identity in Civil Wars", *Perspectives on Politics*, Vol. 1, No. 3, pp. 475-494.

Kennedy, Ryan (2008). "Lifting the Curse: Distribution and Power in Petro-States." Phd Thesis.

King, Gary, R. O. Keohane, and S. Verba (1994). *Designing social inquiry: scientific inference in qualitative research*. Princeton: Princeton University Press.

King, Gary, Michael Tomz, and Jason Wittenberg (2000). "Making the Most of Statistical Analyses: Improving Interpretation and Presentation", *American Journal of Political Science,* Vol. 44, No. 2, pp. 347-361.

King, Gary, Langche Zeng (2001). "Logistic Regression in Rare Events Data", *Political Analysis,* Vol. 9, No. 2, pp. 137-163.

Klare, Michael T. (2009). *Rising Powers, Shrinking Planet: The New Geopolitics of Energy.* New York: Metropolitan Books.

Krain, Matthew, Marissa Edson Myers (1997). "Democracy and civil war: A note on the democratic peace proposition", *International Interactions*, Vol. 23, No. 1, pp. 109-118.

Lam, Ricky and Leonard Wantchekon (2003). "Political Dutch Disease." Working Paper.

Le Billon, Phillipe (2001). "The political ecology of war: natural resources and armed conflicts", *Political Geography*, Vol. 20, No. 5, pp. 561-584.

Le Billon, Phillipe (2003a). "Buying Peace or Fuelling War: The Role of Corruption in Armed Conflicts", *Journal of International Development*, Vol. 15, No. 4, pp. 413-426.

Le Billon, Phillipe (2003b). "Fuelling War: Natural Resources and Armed Conflicts", Oxford: Adelphi Paper 357.

Lipset, Seymour Martin (1959). "Some Social Requisites of Democracy: Economic Development and Political Legitimacy", *The American Political Science Review*, Vol. 53, No. 1, pp. 69-105.

Lotz, Christopher (2008). "Rentierism and Repression", *The Journal of Politics and International Affairs*, Vol. 3, pp. 106-119.

Luciani, Giacomo (1990). "Allocation vs. Production States: A Theoretical Framework", In Giacomo (Ed.), *The Arab State.* London: Routledge.

Lujala, Päivi, Jan Ketil Rød and Nadja Thieme (2007). *"*Fighting over Oil: Introducing a New Dataset", *Conflict Management and Peace Science*, Vol. 24, No. 3, pp. 239-256.

Mahdavi, Hossein (1970). "The Patterns and Problems of Economic Development in Rentier States: The Case of Iran." In M.A. Cook (Ed.), *Studies in The Economic History of the Middle East*, pp. 428-467. London: Oxford University Press.

Mahoney, James, Gary Goertz (2006). "A Tale of Two Cultures: Contrasting Qualitative and Quantitative Research", *Political Analysis*, Vol. 14, pp. 227-249.

Malthus, Thomas Robert (1992[1803]). *An Essay on the Principle of Population*. Cambridge: Cambridge University Press.

Milijkovic, Dragan and Arbindra Rimal (2008) "The impact of socio-economic factors on political stability: A cross-country analysis", *Journal of Socio-Economics*, Vol. 37, No 6, pp. 2454-2463.

Montalvo, Jose G. and Marta Reynal-Querol (2005). "Ethnic Diversity and Economic Development", *Journal of Development Economics*, Vol. 75, No. 2, pp. 293-323.

Muller, Edward N. (1985). "Income Inequality, Regime Repressiveness, and Political Violence", *American Sociological Review*, Vol. 50, No. 1, pp. 47-61.

Muller, Edward N. and Erich Weede (1990). "Cross-National Variation in Political Violence : A Rational Action Approach", *Journal of Conflict Resolution*, Vol. 34, No. 4, pp. 624-651.

Mundy, Jacob (2011) "Deconstructing civil wars: Beyond the new wars debate", *Security Dialogue*, Vol. 42, No. 3, pp. 279-295.

Murdoch, James C. and Todd Sandler (2002). "Economic Growth, Civil Wars, and Spatial Spillovers", *Journal of Conflict Resolution*, Vol. 46, No. 1, pp. 91-110.

Murshed, Mansoob S. (2002) "Conflict, Civil War and Underdevelopment: An Introduction", *Journal of Peace Research*, Vol. 39, No. 4, pp. 387-393.

PITF (2012) Political Instability Task Force, http://globalpolicy.gmu.edu/pitf/.

Przeworski, Adam, Fernando Limongi (1997) "Modernization: Theory and Facts", *World Politics*, Vol. 49, No. 2, pp. 155-183.

Przeworski, Adam, Michael E. Alvarez, Jose Antonio Cheibub and Fernando Limongi (2000). *Democracy and Development: Political Institutions and Well-being in the World, 1950-1990*. Cambridge: Cambridge University Press.

Raleigh, Clionadh, Andrew Linke, Håvard Hegre and Joakim Karlsen (2010). "Introducing ACLED: An Armed Conflict Location and Event Dataset : Special Data Feature", *Journal of Peace Research*, Vol. 47, No. 5, pp. 651-660.

Ron, James (2005). "Paradigm in Distress? Primary Commodities and Civil War", *Journal of Conflict Resolution*, Vol. 49, No. 4, pp. 443-450,

Ross, Michael Lewin (1999). "The Political Economy of the Resource Curse", *World Politics*, Vol. 51, No. 2, pp. 297-322.

Ross, Michael Lewin (2001a). "Does Oil Hinder Democracy?", *World Politics*, Vol. 53, No. 3, pp. 325-361.

Ross, Michael Lewin (2001b). "Natural Resources and Civil Conflict: Evidence from Case Studies." Paper presented at the World Bank/UC Irvine Conference on Civil Wars and post-Conflict Transitions, May 18-20. Irvine, CA.

Ross, Michael Lewin (2001c). "Extractive Sector and the Poor." An Oxfam America Report.

Ross, Michael Lewin (2003). "How Do Natural Resources Influence Civil War? A Medium-N Analysis." Working paper, UCLA.

Ross, Michael Lewin (2010). "Latin America's Missing Oil Wars." Working paper, UCLA.

Ross, Michael Lewin (2004). "What Do We Know About Natural Resources and Civil War?", *Journal of Peace Research*, Vol. 41, No. 3, pp. 337-356.

Reuschmeyer, Dietrich, Evelyn Huber Stephens and John D. Stephens (1992) *Capitalist development and democracy.* Cambridge: Cambridge University Press.

Rummel, R. J. (1995). "Democracy, Power, Genocide, and Mass Murder", *The Journal of Conflict Resolution*, Vol. 39, No. 1, pp. 3-26.

Sachs, Jeffrey D., Andrew M. Warner (2001). "The curse of natural resources", *European Economic Review*, Vol. 45, No. 4-6, pp. 827-838.

Sala-i-Martin, Xavier, Arvind Subramanian (2003). "Addressing the Natural Resource Curse: An Illustration from Nigeria." Working Paper.

Sambanis, Nicholas (2001). “Do Ethnic and Non-Ethnic Civil Wars Have the Same Causes? A Theoretical and Emperical Inquiry (Part1).” The World Bank.

Sambanis, Nicholas (2002). “A Review of Recent Advances and Future Directions in the Quantitative Literature on Civil War”, *Defense and Peace Economics*, Vol. 13 No. 3, pp. 215-243.

Sambanis, Nicholas (2003). “Expanding Economic Models of Civil War Using Case Studies”, *Perspective on Politics*, Vol. 2, No. 2, pp. 259-279.

Sambanis, Nicholas (2004). “What is a civil war? Conceptual and empirical complexities of an operational definition”, *Journal of Conflict Resolution*, Vol. 48 No. 6, pp. 814-858.

Sarkar, S.K., Habshah Midi and Sohel Rana (2011). Detection of Outliers and Influential Observations in Binary Logistic Regression: An Empirical Study, *Journal of Applied Sciences*, Vol. 11, No. 1, pp. 26-35.

Sen, Amartya (2006). *Identity and violence-the illusion of destiny*, New York: W.W. Norton & Company, Inc.

Skocpol, Theda (1979). *States and social revolutions: A comparative analysis of France, Russia, and China*. Cambridge: Cambridge University Press.

Skocpol, Theda (1982). “Rentier State and Shi’a Islam in the Iranian Revolution”, *Theory and Society*, Vol. 11, No. 3, pp. 265-283.

Skog, Ole-Jørgen (2004). *Å Forklare Sosiale Fenomener: En Regresjonsbasert Tilnærming.* Oslo: Gyldendal Norsk Forlag.

Smith, Adam (2005 [1776]). *An Inquiry Into the Nature and Causes of the Wealth of Nations*. USA: Pennsylvania State University.

Smith, Benjamin (2004). “Oil wealth and regime survival in the developing world”, *American Journal of Political Science*, Vol. 48, No. 2, pp. 232-246.

De Soysa, Indra (2000). “The Resource Curse: Are Civil Wars Driven by Rapacity or Paucity?” in Mats Berdal and David Malone (Ed.), *Economic Agendas in Civil Wars*, pp. 113-135. Boulder: Lynne Rienner.

De Soysa, Indra, Eric Neumayer (2007). "Resource Wealth and the Risk of Civil War Onset: Results from a New Dataset of Natural Resource Rent, 1970-1999", *Conflict Management and Peace Science*, Vol. 24, pp. 201-218.

Stine, Robert, A. (1995). "Graphical interpretation of variance inflation factors", *The American Statistician*, Vol. 49 No. 1, pp. 53-56.

Sun Tzu (2002) *The Art of War*. Pensylvania, USA: The Military Service Publishing Company.

Stockemer, Daniel (2010). "Regime type and civil war – a re-evaluation of the inverted U-relationship", *Global Change, Peace & Security*, Vol. 22, No. 3, pp. 261-274.

Themnér, Lotta & Peter Wallensteen (2011). "Armed Conflict, 1946-2010", *Journal of Peace Research*, Vol. 48 No. 4, pp. 525-536.

Tilly, Charles (1978). *From Mobilization to Revolution.* New York: Random House.

Tilly, Charles (2003). The Politics of Collective Violence. Cambridge University Press.

de Toqueville, Alexis (2005 [1840]). *Democracy in America (Complete).* US: The Echo Library

Treismann, Daniel (2000). "The Causes of Corruption: a Cross-National Study", *Journal of Public Economics*, Vol. 76, No. 3, pp. 399-457.

Tsui, Kevin K. (2005). "More Oil, Less Democracy?: Theory and Evidence from Crude Oil Discoveries." Job Market paper at the University of Chicago.

UNDP (2012). Official Website.

http://hdr.undp.org [accessed Mar. 2012

Urdal, Henrik (2005). "People vs. Malthus: population pressure, environmental degradation, and armed conflict revisited", *Journal of Peace Research*, Vol. 42 No. 4, pp. 417–434.

Urdal, Henrik, Raleigh Clionadh (2007). "Climate Change, Environmental Degradation and Armed Conflict", *Political Geography*, Vol. 26, No. 5, pp. 647-694.

Vreeland, James Raymond (2008). The Effect of Political Regime on Civil War: Unpacking Anocracy, *Journal of Conflict Resolution*, Vol. 52, No. 3, pp. 401-425.

Wantchekon, Leonard (2002). “Why Do Resource Dependent Countries Have Authoritarian Governments?”, *Journal of African Finance and Economic Development*, Vol. 5, No. 2, pp. 57-77.

Ward, Michael D, Brian D Greenhill, and Kristin M Bakke (2010). “The Perils of Policy by P value: Predicting Civil Conflicts”, *Journal of Peace Research*, Vol. 47 No. 4, pp. 363-375.

World Bank (2012). www.worldbank.org

Østby, Gudrun (2006). “Horizontal Inequalities, Political Environment and Civil Conflict: Evidence From 55 Developing Countries.” Crise Working Paper No. 28. University of Oxford.

# Appendix

Replication data and Stata do file are available upon request: s.o.gjendem@stv.uio.no

## Appendix 1

Correlation Matrix for all Variables

| | Armed Conflict Onset | Civil War Onset | Natural Resource Rent %GNI | Natural Resource Rent | Energy Resource Rent %GNI | Energy Resource Rent | *Energy Resource Rent % GNI(log)* | *Energy Resource Rent(log)* |
|---|---|---|---|---|---|---|---|---|
| **Armed Conflict Onset** | 1.0000 | | | | | | | |
| **Civil War Onset** | 0.3262 | 1.0000 | | | | | | |
| **Natural Resource Rent %GNI** | 0.1064 | 0.1655 | 1.0000 | | | | | |
| **Natural Resource Rent** | 0.0110 | 0.0239 | 0.2321 | 1.0000 | | | | |
| **Energy Resource Rent %GNI** | 0.0935 | 0.1683 | 0.9730 | 0.2493 | 1.0000 | | | |
| **Energy Resource Rent** | 0.0117 | 0.0261 | 0.2421 | 0.9937 | 0.2663 | 1.0000 | | |
| ***Energy Resource Rent % GNI(log)*** | 0.0626 | 0.0799 | 0.8369 | 0.3261 | 0.8656 | 0.3367 | 1.0000 | |
| ***Energy Resource Rent(log)*** | 0.0326 | 0.0284 | 0.4201 | 0.7549 | 0.4635 | 0.7535 | 0.6630 | 1.0000 |
| **Mineral Resource Rent %GNI** | 0.0060 | -0.0065 | 0.1530 | -0.0274 | -0.0451 | -0.0605 | -0.0217 | -0.1024 |
| **Mineral Resource Rent** | -0.0071 | -0.0080 | 0.0013 | 0.3920 | -0.0464 | 0.2883 | 0.0202 | 0.2525 |
| ***Mineral Resource Rent % GNI(log)*** $_{t-1}$ | 0.0076 | -0.0039 | 0.0942 | -0.0152 | -0.0862 | -0.0548 | -0.0531 | -0.0938 |
| ***Mineral Resource Rent(log)*** | -0.0032 | -0.0039 | -0.0258 | 0.4078 | -0.0778 | 0.3240 | 0.0274 | 0.3473 |
| **Corruption** | 0.1005 | 0.0073 | 0.2530 | 0.0108 | 0.2071 | 0.0167 | 0.2130 | 0.0027 |
| **Political Instability** | -0.0132 | -0.0043 | -0.0085 | -0.0004 | -0.0076 | 0.0009 | 0.0032 | 0.0031 |
| **GDP per capita(log)** | -0.1108 | -0.0237 | -0.0705 | 0.2010 | 0.0068 | 0.2007 | 0.0435 | 0.2862 |
| **GDP Growth(log)** | 0.0152 | -0.0424 | 0.0979 | 0.0535 | 0.0862 | 0.0482 | 0.0939 | 0.0518 |
| **Population(log)** | 0.0747 | 0.0092 | -0.0908 | 0.3419 | -0.0772 | 0.3256 | 0.0673 | 0.4327 |
| **Ethnic Fractionalization** | 0.1038 | 0.0219 | 0.1222 | 0.0247 | 0.0715 | 0.0168 | 0.0664 | 0.0097 |
| **Religious Fractionalization** | 0.0495 | 0.0334 | 0.1369 | -0.0453 | 0.0987 | -0.0479 | 0.0883 | -0.0809 |
| **Ethnic Polerization** | 0.0616 | 0.0099 | 0.1143 | 0.0460 | 0.0654 | 0.0325 | 0.1019 | 0.0628 |
| **Religious Polerization** | 0.0607 | 0.0497 | 0.2001 | -0.0639 | 0.1556 | -0.0659 | 0.1283 | -0.0970 |
| **Democracy** | -0.0300 | -0.0230 | -0.3863 | -0.0561 | -0.3611 | -0.0690 | -0.3752 | -0.1127 |
| **Mountainous Terrain(log)** | 0.0126 | 0.0104 | -0.0429 | 0.1471 | -0.0504 | 0.1408 | 0.0775 | 0.1650 |
| **Time Since Last Onset > 25** | -0.1254 | -0.0570 | -0.1616 | 0.0191 | -0.1395 | 0.0045 | -0.1386 | -0.0140 |
| **Time Since Last Onset >1000** | -0.0828 | -0.0495 | -0.1275 | 0.0832 | -0.1193 | 0.0746 | -0.0953 | 0.0459 |
| **Repression** | 0.1431 | 0.0884 | 0.2149 | 0.0636 | 0.1870 | 0.0631 | 0.2429 | 0.0999 |

*Continued*

| | Mineral Resource Rent %GNI | Mineral Resource Rent | *Mineral Resource Rent % GNI(log)* $_{t-1}$ | *Mineral Resource Rent(log)* | Corruption | GDP per capita(log) | GDP Growth(log) | Population(log) | Ethnic Fractionalization |
|---|---|---|---|---|---|---|---|---|---|
| **Mineral Resource Rent %GNI** | 1.0000 | | | | | | | | |
| **Mineral Resource Rent** | 0.2734 | 1.0000 | | | | | | | |
| ***Mineral Resource Rent % GNI(log)*** $_{t-1}$ | 0.9104 | 0.3301 | 1.0000 | | | | | | |
| ***Mineral Resource Rent(log)*** | 0.3169 | 0.8290 | 0.4275 | 1.0000 | | | | | |
| **Corruption** | 0.1164 | -0.0585 | 0.1314 | -0.1080 | 1.0000 | | | | |
| **Political Instability** | -0.0079 | -0.0144 | -0.0010 | -0.0211 | 0.0397 | 1.0000 | | | |
| **GDP per capita(log)** | -0.1377 | 0.1092 | -0.1614 | 0.1483 | -0.6125 | -0.0672 | 1.0000 | | |
| **GDP Growth(log)** | 0.0157 | 0.0366 | 0.0294 | 0.0267 | 0.1572 | -0.0332 | -0.1271 | 1.0000 | |
| **Population(log)** | -0.1023 | 0.1927 | -0.0762 | 0.3172 | 0.0982 | 0.0152 | -0.0604 | 0.0587 | 1.0000 |
| **Ethnic Fractionalization** | 0.0819 | 0.0562 | 0.1481 | 0.1071 | 0.3438 | 0.0370 | -0.5918 | 0.0673 | 0.0903 |
| **Religious Fractionalization** | 0.0206 | -0.0324 | 0.0637 | -0.0454 | 0.3821 | 0.0149 | -0.5331 | 0.1855 | 0.0493 |
| **Ethnic Polerization** | 0.2007 | 0.1154 | 0.2737 | 0.1962 | 0.1894 | 0.0306 | -0.2110 | 0.0875 | -0.0901 |
| **Religious Polerization** | 0.0565 | -0.0353 | 0.1119 | -0.0471 | 0.4223 | 0.0304 | -0.5964 | 0.1618 | -0.0122 |
| **Democracy** | -0.0237 | 0.1126 | -0.0164 | 0.1566 | -0.4428 | -0.0939 | 0.4803 | -0.0969 | 0.0227 |
| **Mountainous Terrain(log)** | 0.0999 | 0.0866 | 0.1045 | 0.1610 | -0.0448 | -0.0131 | -0.0047 | 0.0162 | 0.3659 |
| **Time Since Last Onset > 25** | 0.0137 | 0.1405 | 0.0291 | 0.1159 | -0.2256 | -0.0698 | 0.3826 | -0.0268 | -0.1285 |
| **Time Since Last Onset >1000** | 0.0088 | 0.1104 | 0.0039 | 0.0494 | 0.0892 | 0.0011 | 0.1611 | 0.0137 | -0.0662 |
| **Repression** | 0.0230 | -0.0065 | 0.0503 | 0.0207 | 0.5410 | 0.0680 | -0.5286 | 0.0933 | 0.3415 |

*Continued*

| | Ethnic Fractionalization | Religious Fractionalization | Ethnic Polerization | Religious Polerization | Democracy | Democracy | Time Since Last Onset > 25 | Time Since Last Onset >1000 | Repression |
|---|---|---|---|---|---|---|---|---|---|
| **Ethnic Fractionalization** | 1.0000 | | | | | | | | |
| **Religious Fractionalization** | 0.5316 | 1.0000 | | | | | | | |
| **Ethnic Polerization** | 0.6243 | 0.2430 | 1.0000 | | | | | | |
| **Religious Polerization** | 0.5719 | 0.9545 | 0.3072 | 1.0000 | | | | | |
| **Democracy** | -0.3079 | -0.4247 | -0.1481 | -0.4404 | 1.0000 | | | | |
| **Mountainous Terrain(log)** | 0.0243 | -0.0715 | 0.0496 | -0.0866 | 0.0434 | 1.0000 | | | |
| **Time Since Last Onset > 25** | -0.2475 | -0.1207 | -0.1368 | -0.1426 | 0.2300 | -0.0909 | 1.0000 | | |
| **Time Since Last Onset >1000** | -0.0743 | -0.1288 | -0.0188 | -0.1540 | 0.2248 | -0.0598 | 0.5722 | 1.0000 | |
| **Repression** | 0.3447 | 0.2854 | 0.2234 | 0.3126 | -0.3867 | 0.1860 | -0.3977 | -0.1838 | 1.0000 |

# Appendix 2.

*Logit model – Energy rent, Corruption and Civil War Onset (1985-2008)*

| | **Model 5.1** *Civil War Onset* | **Model 5.2** *Civil War Onset* | **Model 5.3** *Civil War Onset* | **Model 5.4** *Civil War Onset* | **Model 5.5** *Civil War Onset* | **Model 5.6** *Civil War Onset* |
|---|---|---|---|---|---|---|
| ***Energy Resource Rent % GNI(log)*** $_{t-1}$ *(dependence)* | 0.616 (1.59) | 0.672 (2.01)** | 0.810 (2.19)** | | | |
| ***Energy Resource Rent % GNI(log)* Corruption (c)*** $_{t-1}$ | | | -0.245 (-0.99) | | | |
| ***Energy Resource Rent(log)*** $_{t-1}$ *(abundance)* | | | | 0.936 (2.91)*** | 0.91 (2.45)** | 1.059 (3.33)*** |
| ***Energy Resource Rent(log) * Corruption(c)*** $_{t-1}$ | | | | | | -0.468 (-2.01)** |
| ***Corruption(c)*** $_{t-1}$ | | 0.266 (0.56) | 0.579 (0.92) | | 0.299 (0.70) | 0.816 (1.36) |
| ***Mineral Resource Rent % GNI(log)*** $_{t-1}$ | -0.818 (-0.97) | -0.949 (-1.04) | -0.900 (-0.80) | | | |
| ***Mineral Resource Rent (log)*** $_{t-1}$ | | | | -0.784 (-1.31) | -0.831 (-1.32) | -1.590 (-1.85) |
| ***Gdp per capita(log)*** $_{t-1}$ | -0.333 (-0.69) | -0.009 (-0.02) | 0.035 (0.08) | -0.452 (-1.89)* | -0.155 (-0.71) | -0.190 (-0.86) |
| ***GDP Growth(log)*** $_{t-1}$ | -0.628 (-2.94)*** | -0.461 (-1.47) | -0.453 (-1.47) | -0.603 (-2.48)** | -0.437 (-1.50) | -0.360 (-1.28) |
| ***Population(log)*** $_{t-1}$ | 0.125 (0.37) | 0.204 (0.59) | 0.303 (0.74) | -0.092 (-0.32) | -0.054 (-0.20) | -0.054 (-0.21) |
| ***Ethnic Fractionalization*** | -0.676 (-0.74) | -0.265 (-0.31) | -0.167 (-0.19) | -1.147 (-1.50) | -0.837 (-1.20) | -1.050 (-1.22) |
| ***Religious Fractionalization*** | 1.799 (1.99)** | 1.808 (2.14)** | 1.955 (2.16)** | 2.143 (1.87)* | 2.216 (2.11)** | 2.642 (1.83)* |
| ***Democracy*** $_{t-1}$ | 0.104 (1.13) | 0.245 (2.30)** | 0.237 (2.42)** | 0.098 (1.41) | 0.201 (3.07)*** | 0.179 (2.15)** |
| ***Democracy***$^2$ $_{t-1}$ | -0.019 (-1.19) | -0.037 (-1.86)* | -0.036 (-1.91)* | -0.022 (-1.63) | -0.038 (-2.54)** | -0.043 (-3.06)*** |
| ***Mountainous Terrain(log)*** | 0.169 (0.65) | -0.049 (-0.29) | -0.077 (-0.45) | 0.111 (0.38) | -0.097 (-0.35) | -0.037 (-0.11) |
| ***Time Since Last Onset*** | 0.003 (0.02) | 0.070 (0.38) | 0.131 (0.58) | -0.110 (-0.71) | -0.048 (-0.26) | -0.0675 (-0.33) |
| ***Observations*** | 2091 | 1890 | 1890 | 2091 | 1890 | 1890 |
| ***Countries*** | 105 | 95 | 95 | 95 | 95 | 95 |
| ***Pseudo R***$^2$ | .143 | .146 | .157 | .123 | .128 | .129 |
| ***LL*** | -38.79 | -31.48 | -31.26 | -39.37 | -32.44 | -31.15 |

# Appendix 3

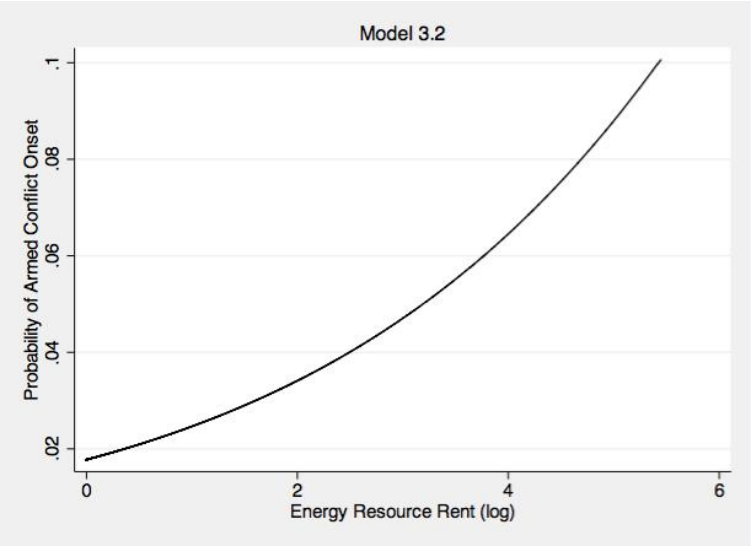
*"Bivariate" Analysis with Square term of Explanatory Variables.*

| Dependence | | | Abundance | | |
|---|---|---|---|---|---|
| | **Model 4.1** | **Model 4.2** | | **Model 4.3** | **Model 4.4** |
| | *Armed Conflict Onset* | *Civil War Onset* | | *Armed Conflict Onset* | *Civil War Onset* |
| ***Natural Resource Rent % GNI*** $_{t-1}$ | 0.044 | 0.048 | ***Natural Resource Rent*** $_{t-1}$ | 0.021 | 0.119 |
| | (3.16)*** | (2.10)** | | (1.88)* | (2.00)** |
| ***Natural Resource Rent % GNI*** $^2_{t-1}$ | -0.001 | -0.001 | ***Natural Resource Rent*** $^2_{t-1}$ | -0.000 | -0.002 |
| | (-1.92) | (-1.37) | | (-0.71) | (-1.18) |
| ***Energy Resource Rent % GNI*** $_{t-1}$ | 0.037 | 0.0472 | ***Energy Resource Rent*** $_{t-1}$ | 0.021 | 0.113 |
| | (2.46)** | (1.97)** | | (2.12)** | (2.27)** |
| ***Energy Resource Rent % GNI*** $^2_{t-1}$ | -0.001 | -0.001 | ***Energy Resource Rent*** $_{t-1}$ | -0.000 | -0.002 |
| | (-1.66) | (-1.27) | | (-0.77) | (-1.23) |
| ***Mineral Resource Rent % GNI*** $_{t-1}$ | 0.028 | -0.046 | ***Mineral Resource Rent*** $_{t-1}$ | 0.394 | 1.182 |
| | (0.38) | (-0.21) | | (2.62)*** | (1.89)* |
| ***Mineral Resource Rent % GNI*** $^2_{t-1}$ | -0.003 | -0.006 | ***Mineral Resource Rent*** $_{t-1}$ | -0.017 | -0.142 |
| | (-0.59) | (-0.42) | | (-1.37) | (-0.92) |

Models include a variable measuring time since last onset and three cubic splines to correct for temporal dependence.

# Appendix 4

*The Effect of Energy Resource Dependence on the Probability of Armed Conflict Onset.*



## Appendix 5. VIF-values

| Variable | Model 1.1. | Model 1.2 | Model 1.3 | Model 1.4 |
|---|---|---|---|---|
| ***Natural Resource Rent % GNI(c)*** $_{t-1}$ | 3.58 | | 3.62 | |
| ***Natural Resource Rent % GNI(c)*** $^2$ $_{t-1}$ | 3.31 | | 3.34 | |
| ***Natural Resource Rent(c)*** $_{t-1}$ | | 4.97 | | 5.13 |
| ***Natural Resource Rent (c)*** $^2$ $_{t-1}$ | | 4.21 | | 4.29 |
| ***Political Instability*** $_{t-1}$ | 1.02 | 1.01 | 1.01 | 1.01 |
| ***Gdp per capita(log)*** $_{t-1}$ | 2.62 | 2.73 | 2.56 | 2.69 |
| ***GDP Growth(log)*** $_{t-1}$ | 1.05 | 1.05 | 1.05 | 1.05 |
| ***Population(log)*** $_{t-1}$ | 1.19 | 1.39 | 1.19 | 1.39 |
| ***Ethnic Fractionalization*** | 1.64 | 1.66 | 1.64 | 1.66 |
| ***Religious Fractionalization*** | 1.67 | 1.67 | 1.64 | 1.63 |
| ***Democracy*** $_{t-1}$ | 1.67 | 1.53 | 1.77 | 1.63 |
| ***Democracy*** $^2$ $_{t-1}$ | 1.80 | 1.77 | 1.82 | 1.79 |
| ***Mountainous Terrain(log)*** | 1.18 | 1.17 | 1.18 | 1.17 |
| ***Time Since Last Onset*** | 1.17 | 1.17 | 1.13 | 1.16 |

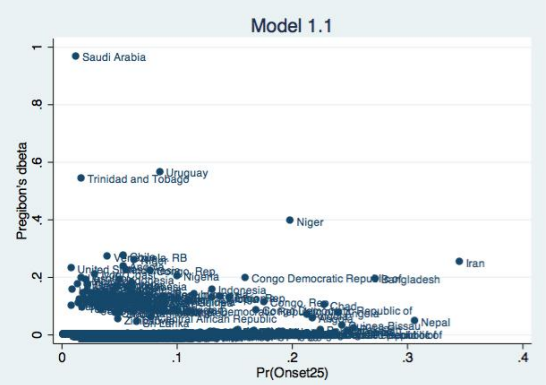
| Variable | Model 2.1 | Model 2.2 | Model 2.2 | Model 2.2 |
|---|---|---|---|---|
| ***Energy Resource Rent % GNI(c)*** $_{t-1}$ | 4.17 | | 4.24 | |
| ***Energy Resource Rent % GNI(c)*** $^2$ $_{t-1}$ | 3.80 | | 3.84 | |
| ***Mineral Resource Rent % GNI(c)*** $_{t-1}$ | 4.22 | | 4.23 | |
| ***Mineral Resource Rent % GNI(c)*** $^2$ $_{t-1}$ | 4.09 | | 4.10 | |
| ***Energy Resource Rent(c)*** | | 5.03 | | 5.19 |
| ***Energy Resource Rent(c)*** $^2$ | | 4.26 | | 4.34 |
| ***Mineral Resource Rent(c)*** | | 4.41 | | 4.39 |
| ***Mineral Resource Rent (c)*** $^2$ | | 3.97 | | 3.97 |
| ***Political Instability*** $_{t-1}$ | 1.02 | 1.01 | 1.01 | 1.01 |
| ***Gdp per capita(log)*** $_{t-1}$ | 2.75 | 2.78 | 2.70 | 2.75 |
| ***GDP Growth(log)*** $_{t-1}$ | 1.06 | 1.05 | 1.06 | 1.05 |
| ***Population(log)*** $_{t-1}$ | 1.22 | 1.40 | 1.22 | 1.40 |
| ***Ethnic Fractionalization*** | 1.66 | 1.73 | 1.66 | 1.73 |
| ***Religious Fractionalization*** | 1.70 | 1.68 | 1.67 | 1.64 |
| ***Democracy*** $_{t-1}$ | 1.70 | 1.55 | 1.80 | 1.66 |
| ***Democracy*** $^2$ $_{t-1}$ | 1.81 | 1.79 | 1.83 | 1.81 |
| ***Mountainous Terrain(log)*** | 1.18 | 1.18 | 1.18 | 1.18 |
| ***Time Since Last Onset*** | 1.17 | 1.18 | 1.14 | 1.16 |

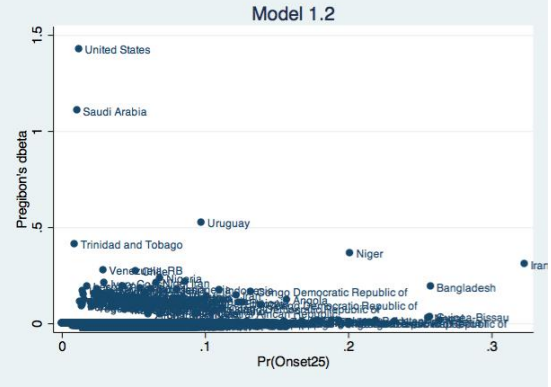
| Variable | Model 3.1 | Model 3.2 | Model 3.2 | Model 3.2 |
|---|---|---|---|---|
| ***Energy Resource Rent % GNI(log)*** $_{t-1}$ | 1.25 | | 1.26 | |
| ***Mineral Resource Rent % GNI(log)*** $_{t-1}$ | 1.07 | | 1.07 | |
| ***Energy Resource Rent(log)*** $_{t-1}$ | | 1.67 | | 1.72 |
| ***Mineral Resource Rent(log)*** $_{t-1}$ | | 1.29 | | 1.28 |
| ***Political Instability*** $_{t-1}$ | 1.02 | 1.01 | 1.01 | 1.01 |
| ***Gdp per capita(log)*** $_{t-1}$ | 2.80 | 2.99 | 2.74 | 2.97 |
| ***GDP Growth(log)*** $_{t-1}$ | 1.05 | 1.05 | 1.05 | 1.05 |
| ***Population(log)*** $_{t-1}$ | 1.21 | 1.50 | 1.21 | 1.50 |
| ***Ethnic Fractionalization*** | 1.69 | 1.77 | 1.68 | 1.76 |
| ***Religious Fractionalization*** | 1.70 | 1.68 | 1.66 | 1.64 |
| ***Democracy*** $_{t-1}$ | 1.67 | 1.60 | 1.77 | 1.72 |
| ***Democracy*** $^2$ $_{t-1}$ | 1.81 | 1.78 | 1.82 | 1.80 |
| ***Mountainous Terrain(log)*** | 1.18 | 1.18 | 1.18 | 1.18 |
| ***Time Since Last Onset*** | 1.6 | 1.17 | 1.13 | 1.15 |

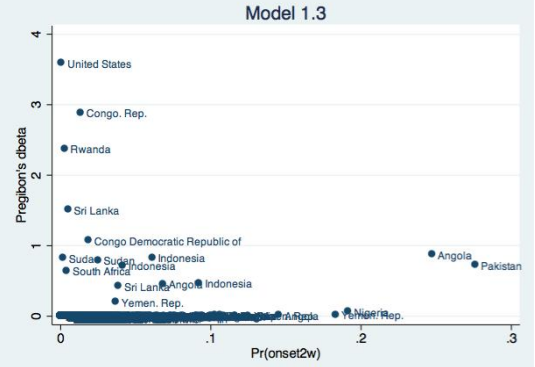
| Variable | **Model 4.1** | **Model 4.2** | **Model 4.3** | **Model 4.4** | **Model 4.5** | **Model 4.6** |
|---|---|---|---|---|---|---|
| ***Energy Resource Rent % GNI*** $_{t-1}$ | 1.25 | 1.43 | 1.50 | | | |
| ***Energy Resource Rent % GNI* Corruption(c)*** | | | 1.74 | | | |
| ***Energy Resource Rent*** $_{t-1}$ | | | | 1.67 | 1.88 | 1.91 |
| ***Energy Resource Rent * Corruption(c)*** | | | | | | 1.63 |
| ***Corruption(c)*** $_{t-1}$ | | 1.87 | 2.50 | | 1.80 | 2.40 |
| ***Mineral Resource Rent % GNI*** $_{t-1}$ | 1.07 | 1.09 | 1.09 | | | |
| ***Mineral Resource Rent*** $_{t-1}$ | | | | 1.29 | 1.31 | 1.32 |
| ***Political Instability*** $_{t-1}$ | 102 | 1.02 | 1.02 | 1.01 | 1.02 | 1.02 |
| ***Gdp per capita(log)*** $_{t-1}$ | 2.80 | 3.55 | 3.56 | 2.99 | 3.97 | 4.02 |
| ***GDP Growth(log)*** $_{t-1}$ | 1.05 | 1.06 | 1.06 | 1.05 | 1.07 | 1.07 |
| ***Population(log)*** $_{t-1}$ | 1.21 | 1.23 | 1.25 | 1.50 | 1.58 | 1.58 |
| ***Ethnic Fractionalization*** | 1.69 | 1.78 | 1.78 | 1.77 | 1.93 | 1.94 |
| ***Religious Fractionalization*** | 1.70 | 1.78 | 1.78 | 1.68 | 1.79 | 1.79 |
| ***Democracy*** $_{t-1}$ | 1.67 | 1.82 | 1.82 | 1.60 | 1.76 | 1.80 |
| ***Democracy*** $^{2}_{t-1}$ | 1.81 | 2.23 | 2.23 | 1.78 | 2.22 | 2.22 |
| ***Mountainous Terrain(log)*** | 1.18 | 1.22 | 1.22 | 1.18 | 1.19 | 1.19 |
| ***Time Since Last Onset*** | 1.16 | 1.27 | 1.27 | 1.17 | 1.26 | 1.27 |

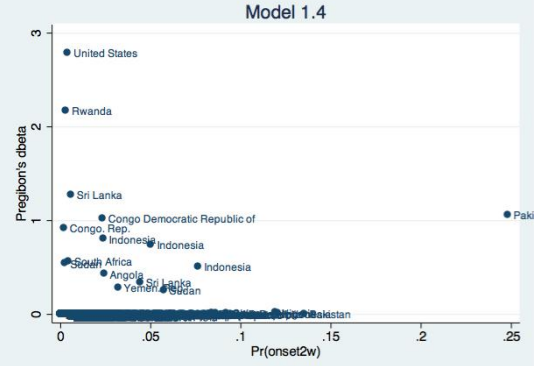
# Appendix 6.

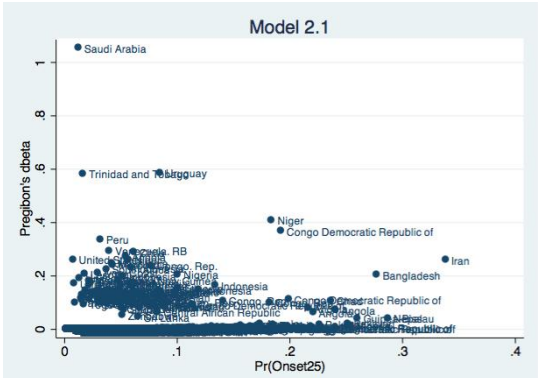
Influential observations

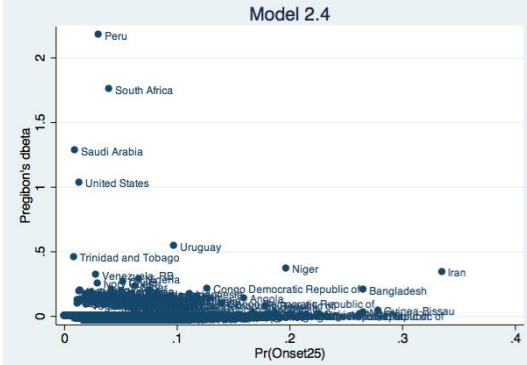


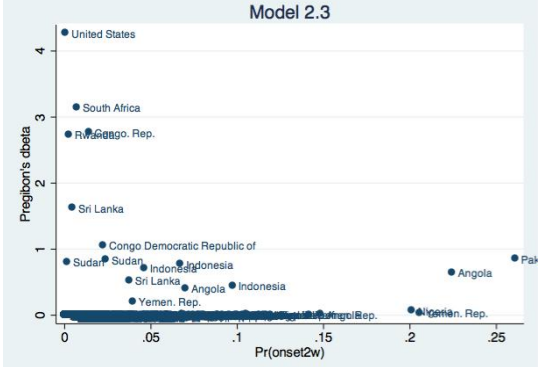



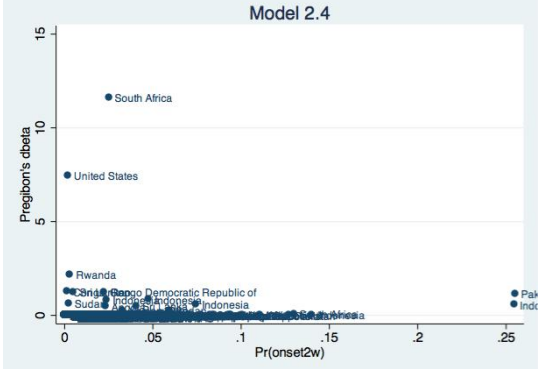



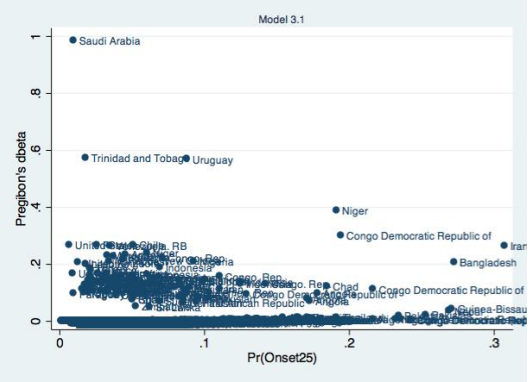



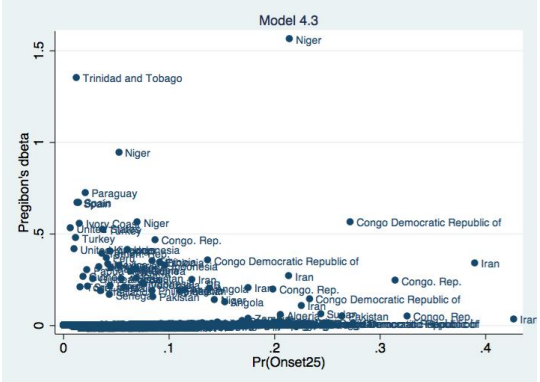



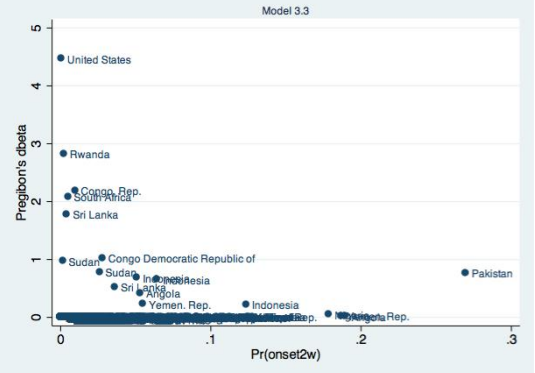



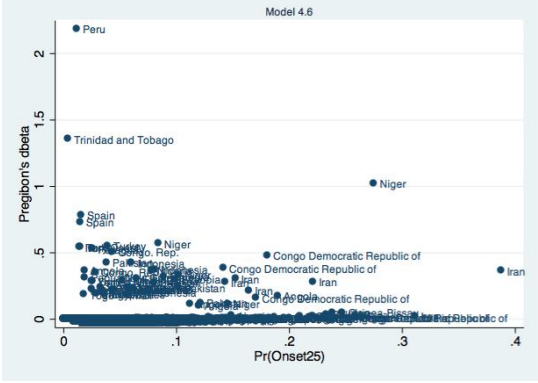



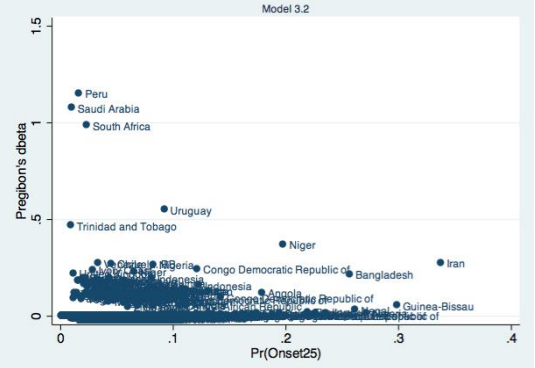



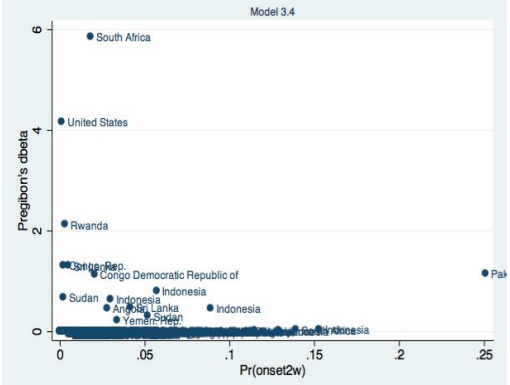


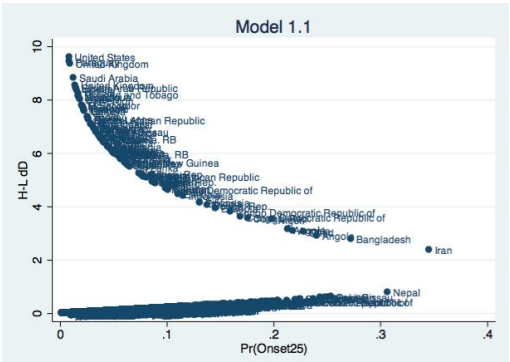



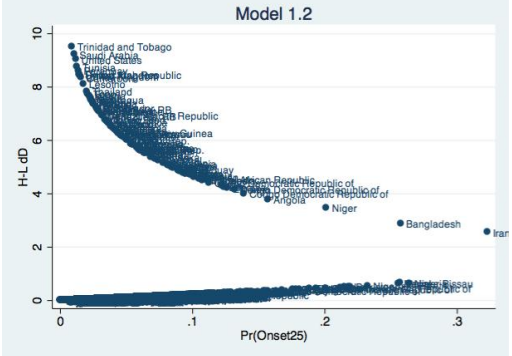



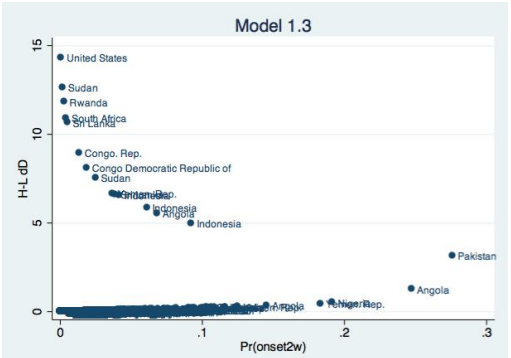



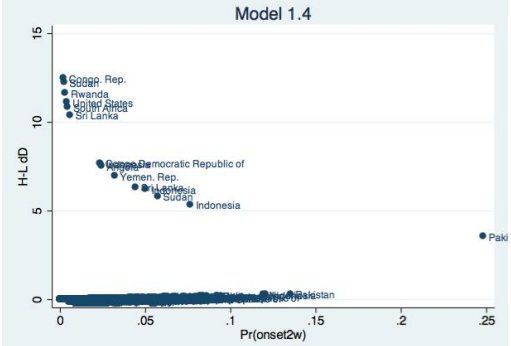



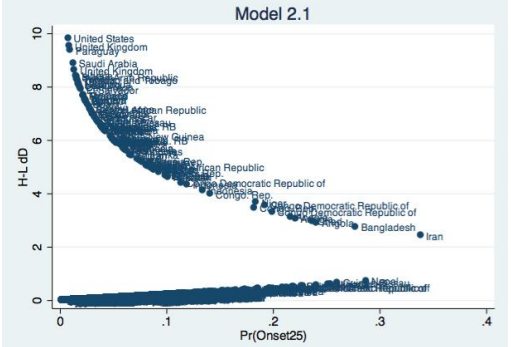

# Appendix 7.
Outliers

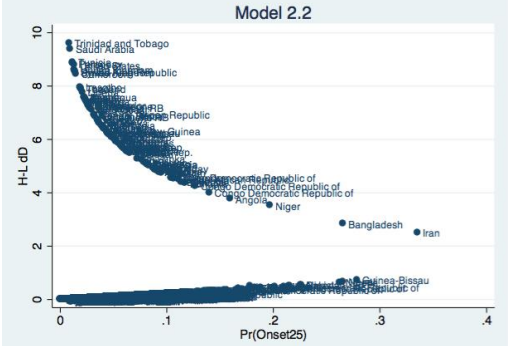


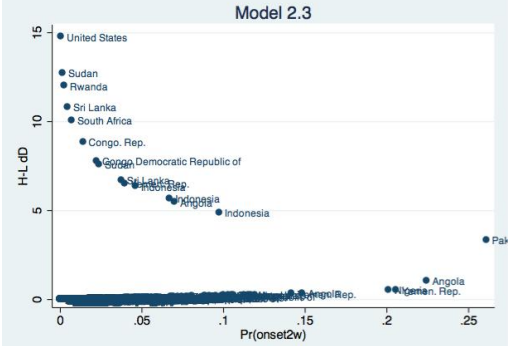



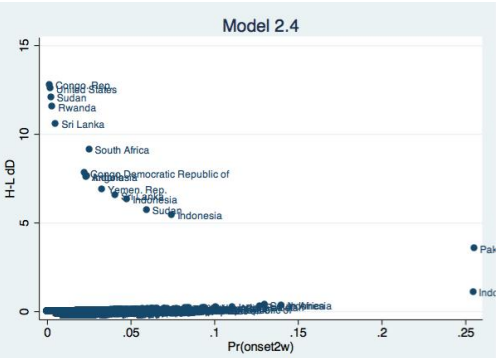

Model 1.3
H-L dD
Pr(onset2w)
United States
Sudan
Rwanda
Sri Lanka
South Africa
Congo. Rep.
Congo Democratic Republic of
Sudan
Indonesia
Angola
Indonesia
Pakistan
Angola

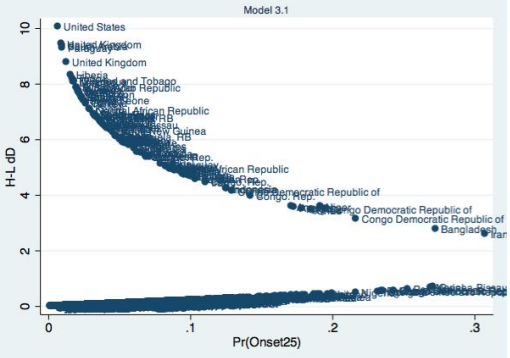

Model 1.4
H-L dD
Pr(onset2w)
Congo. Rep.
Sudan
Rwanda
United States
South Africa
Sri Lanka
Yemen. Rep.
Indonesia
Sudan
Indonesia

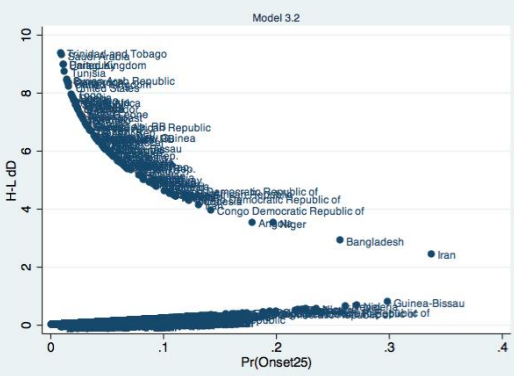

Model 2.1
H-L dD
Pr(Onset25)
United States
United Kingdom
Paraguay
Saudi Arabia
Bangladesh
Iran

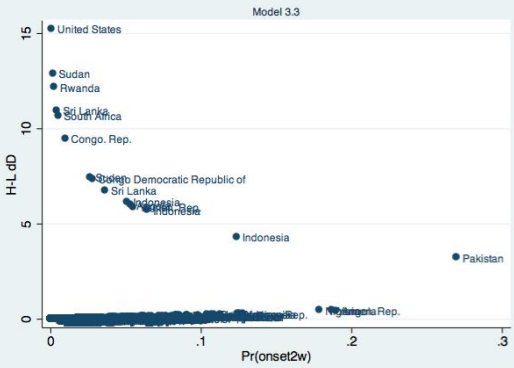

Model 2.2
H-L dD
Pr(Onset25)
Trinidad and Tobago
Saudi Arabia
Angola
Niger
Bangladesh
Iran
Guinea-Bissau

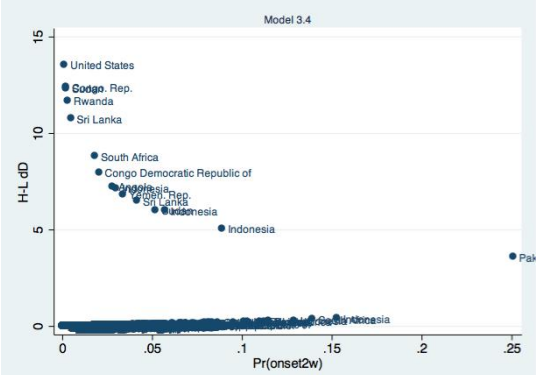

Model 2.3
H-L dD
Pr(onset2w)
United States
Sudan
Rwanda
Sri Lanka
South Africa
Congo. Rep.
Indonesia
Angola

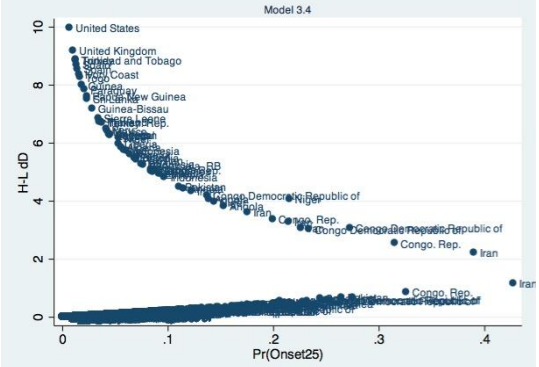

Model 2.4
H-L dD
Pr(onset2w)
Congo. Rep.
United States
Sudan
Rwanda
Sri Lanka
South Africa
Yemen. Rep.
Indonesia
Sudan
Indonesia

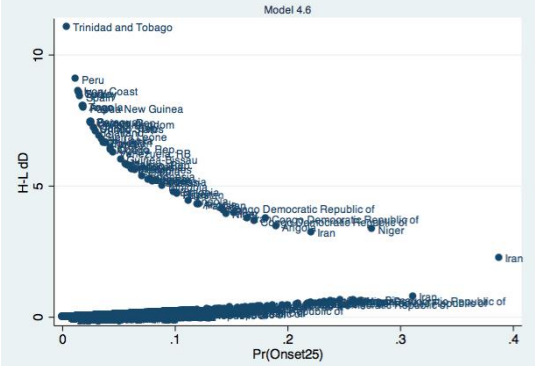

Model 3.1
H-L dD
Pr(Onset25)
United States
United Kingdom
Bangladesh
Iran

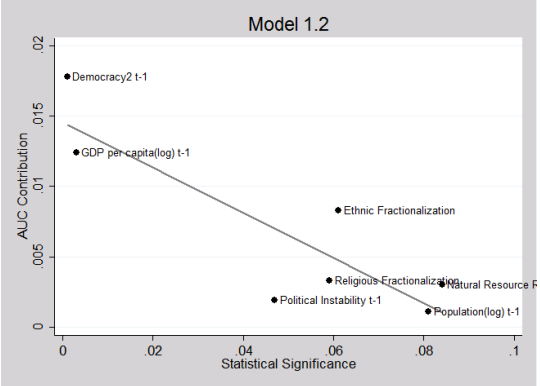

Model 3.2
H-L dD
Pr(Onset25)
Trinidad and Tobago
Tunisia
Angola
Niger
Bangladesh
Iran
Guinea-Bissau

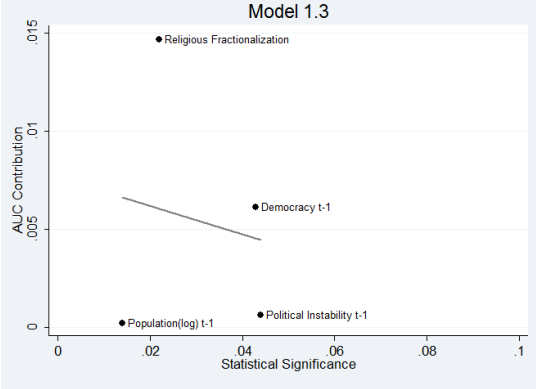

Model 3.3
H-L dD
Pr(onset2w)
United States
Sudan
Rwanda
Sri Lanka
South Africa
Congo. Rep.
Sri Lanka
Indonesia
Indonesia
Pakistan

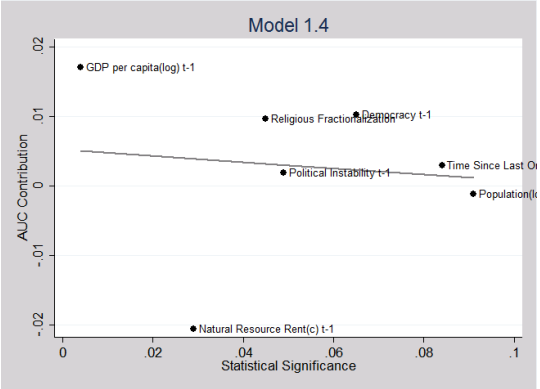


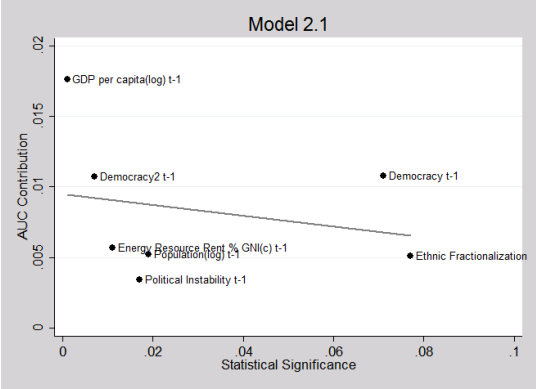



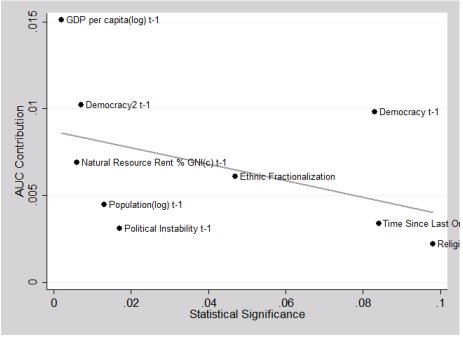



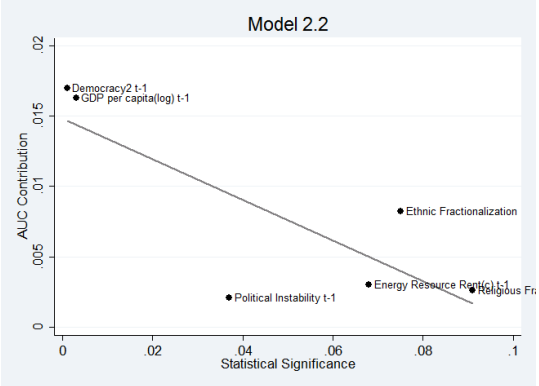



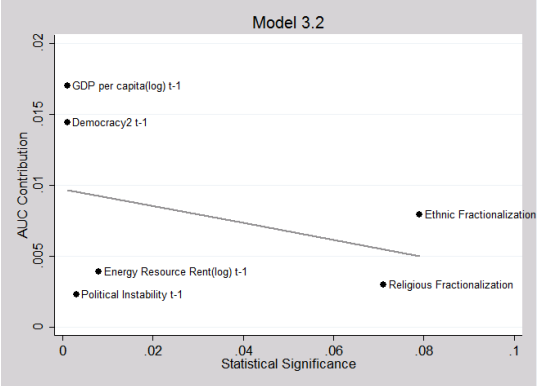



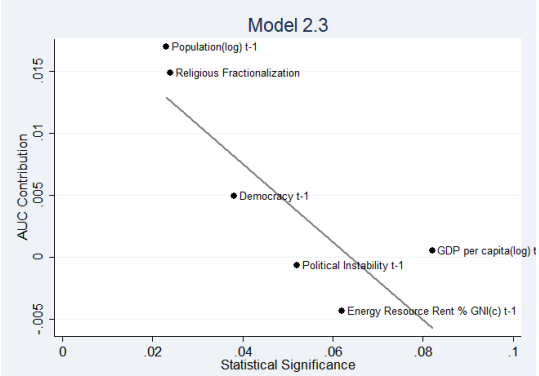

# Appendix 8.

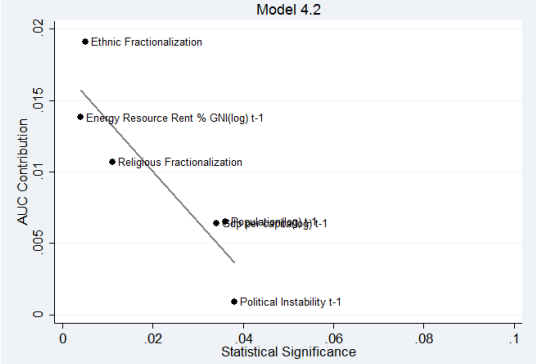
Comparion of Statistical Significance and Predictive Power.

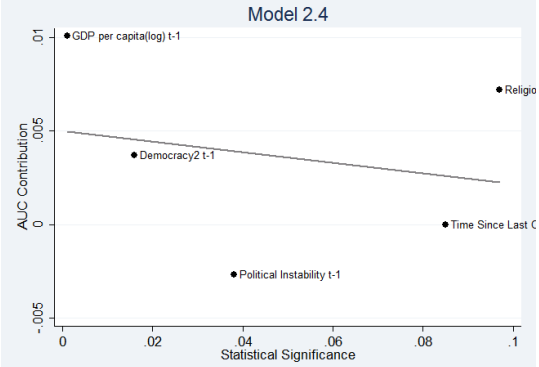


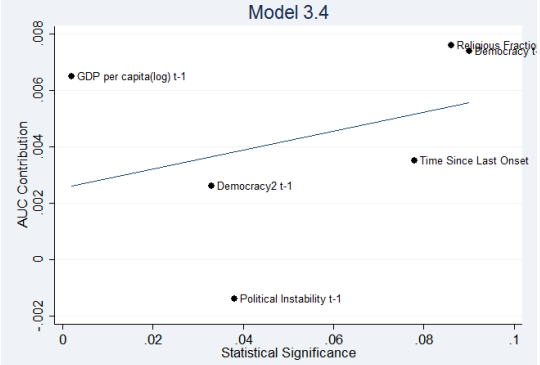

Model 2.2
Democracy2 t-1
GDP per capita(log) t-1
Ethnic Fractionalization
Political Instability t-1
AUC Contribution
Statistical Significance

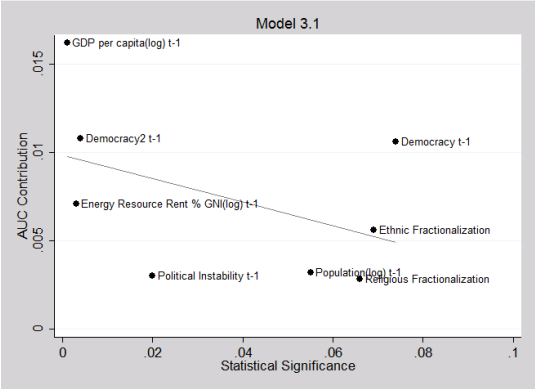

Model 3.2
GDP per capita(log) t-1
Democracy2 t-1
Ethnic Fractionalization
Energy Resource Rent(log) t-1
Religious Fractionalization
Political Instability t-1
AUC Contribution
Statistical Significance

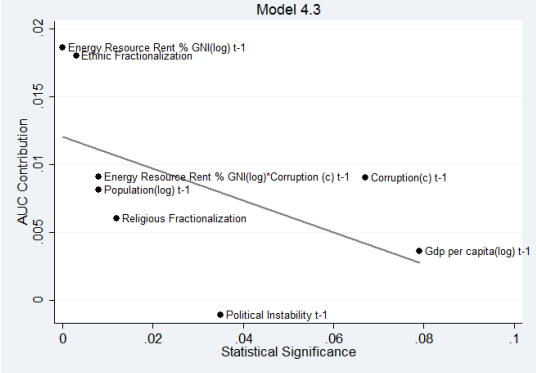

Model 2.3
Population(log) t-1
Religious Fractionalization
Democracy t-1
GDP per capita(log) t
Political Instability t-1
Energy Resource Rent % GNI(c) t-1
AUC Contribution
Statistical Significance

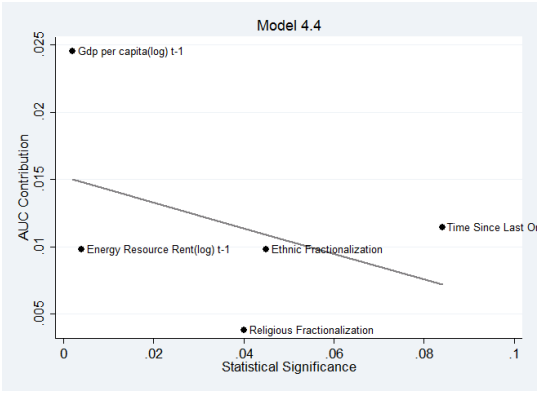

Model 4.2
Ethnic Fractionalization
Energy Resource Rent % GNI(log) t-1
Religious Fractionalization
Political Instability t-1
AUC Contribution
Statistical Significance

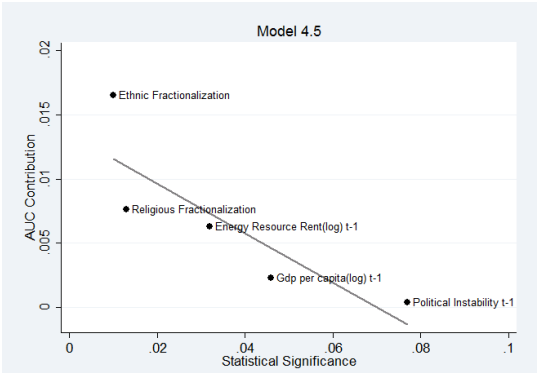

Model 2.4
GDP per capita(log) t-1
Democracy2 t-1
Political Instability t-1
AUC Contribution
Statistical Significance

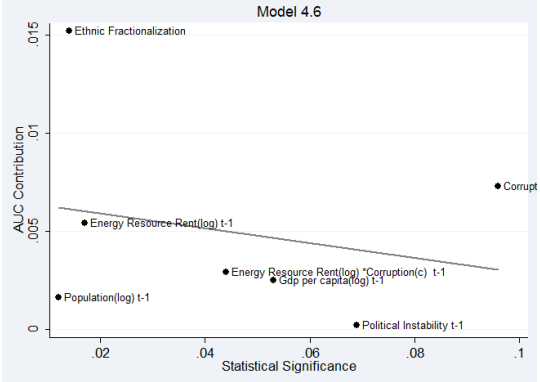

Model 3.4
GDP per capita(log) t-1
Time Since Last Onset
Democracy2 t-1
Political Instability t-1
AUC Contribution
Statistical Significance


Model 3.1
GDP per capita(log) t-1
Democracy2 t-1
Democracy t-1
Energy Resource Rent % GNI(log) t-1
Ethnic Fractionalization
Political Instability t-1
Religious Fractionalization
AUC Contribution
Statistical Significance


Model 4.3
Energy Resource Rent % GNI(log) t-1
Ethnic Fractionalization
Energy Resource Rent % GNI(log)*Corruption (c) t-1
Corruption(c) t-1
Population(log) t-1
Religious Fractionalization
Gdp per capita(log) t-1
Political Instability t-1
AUC Contribution
Statistical Significance


Model 4.4
Gdp per capita(log) t-1
Time Since Last Ou
Energy Resource Rent(log) t-1
Ethnic Fractionalization
Religious Fractionalization
AUC Contribution
.005
.01
.015
.02
.025
0
.02
.04
.06
.08
.1
Statistical Significance


Model 4.5
Ethnic Fractionalization
Religious Fractionalization
Energy Resource Rent(log) t-1
Gdp per capita(log) t-1
Political Instability t-1
AUC Contribution
0
.005
.01
.015
.02
0
.02
.04
.06
.08
.1
Statistical Significance


Model 4.6
Ethnic Fractionalization
Corrupt
Energy Resource Rent(log) t-1
Energy Resource Rent(log) *Corruption(c) t-1
Gdp per capita(log) t-1
Population(log) t-1
Political Instability t-1
AUC Contribution
0
.005
.01
.015
.02
.04
.06
.08
.1
Statistical Significance